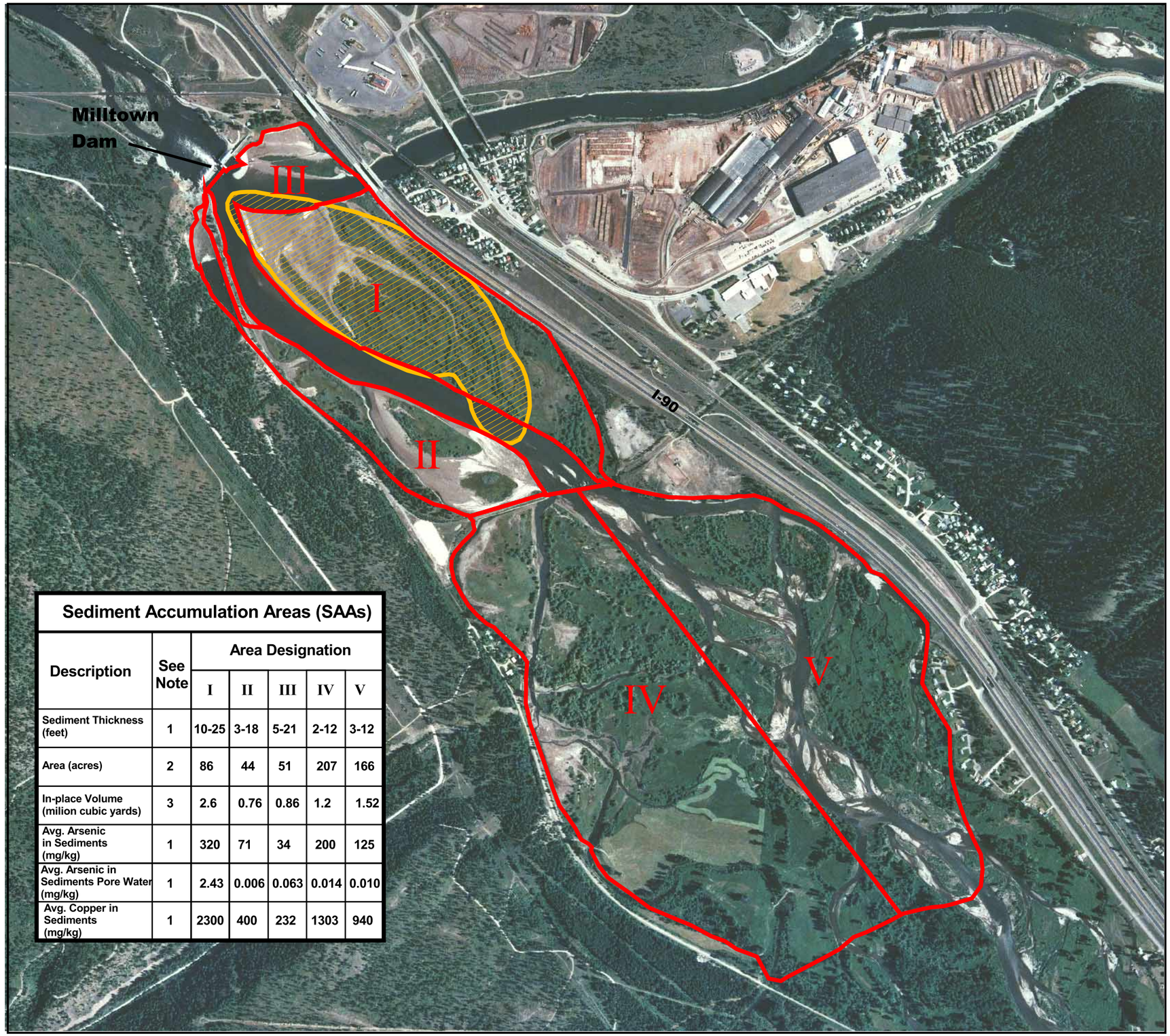
FIGURES



Sediment Accumulation Areas (SAAs)

Description	See Note	Area Designation				
		I	II	III	IV	V
Sediment Thickness (feet)	1	10-25	3-18	5-21	2-12	3-12
Area (acres)	2	86	44	51	207	166
In-place Volume (milion cubic yards)	3	2.6	0.76	0.86	1.2	1.52
Avg. Arsenic in Sediments (mg/kg)	1	320	71	34	200	125
Avg. Arsenic in Sediments Pore Water (mg/kg)	1	2.43	0.006	0.063	0.014	0.010
Avg. Copper in Sediments (mg/kg)	1	2300	400	232	1303	940

Legend

- Sediment Accumulation Area (SAA) Boundary
- Approximate Boundary of Groundwater Plume Source Area

Notes:

1. Information obtained from Final Draft Milltown Remedial Investigation Report (prepared by Titan Environmental Corporation for ARCO, February 1995)
2. Accumulation Area acreage determined using tools in ArcView v. 3.2.
3. Accumulation Area volume information generally obtained from presentation materials at Clark Fork Basin Symposium 2000 (April14-16) based on Harding Lawson's total reservoir estimate of 6.6 million cubic yards (HLA, 1997). SAA I sediment volume estimate of 2.6 MCY has been confirmed by calculation based on sediment thickness isopach presented as Figure B-16 in the Remedial Investigation Report. SAA III estimated volume and maximum sediment thickness updated from symposium values based on additional sediment cores obtained by EPA in 2002.
4. Extents of Source Characterization Sediment Accumulation Areas I-V shown in this figure were modified from Figure ES-3 of the Final Draft Remedial investigation Report. Modifications include exclusion of areas outside the FEMA 100 yr floodplain. Upstream boundary based on approximate extent of area innundated by a maximum pool elevation of 3263.5 feet above MSL.

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SEDIMENT ACCUMULATION AREA BOUNDARIES
MILLTOWN RESERVOIR SEDIMENTS SITE

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FIGURE 1-1

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CLARK FORK RIVER
HISTORICAL CHANNEL ALIGNMENT

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FIGURE 2-1

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Revision: 1

Figure 2-2
Comparison of Thalweg Profiles, 1981 - 1997

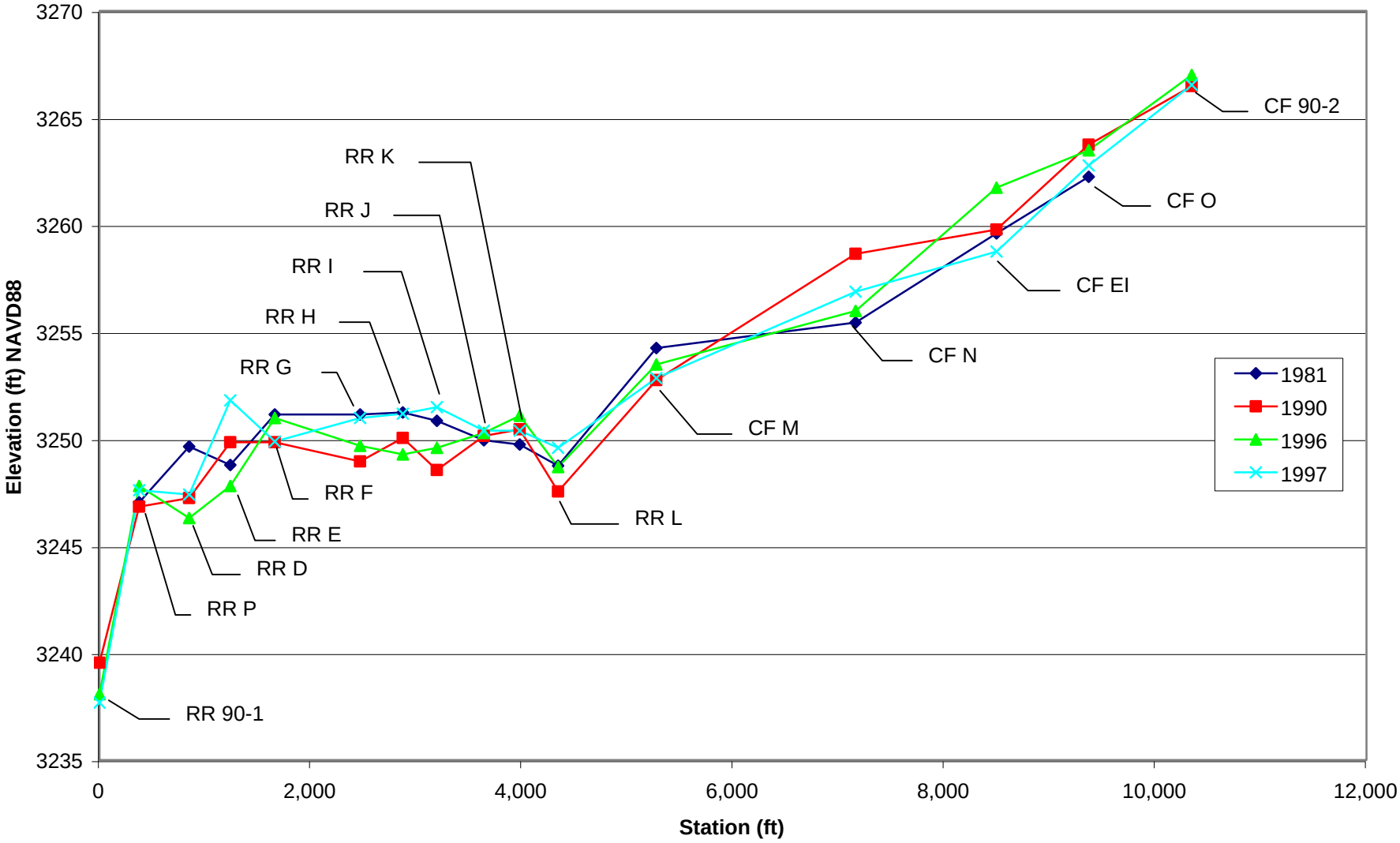

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Figure 2-3a
Geomorphic Evolution of Cross-Section F, 1981 - 1997

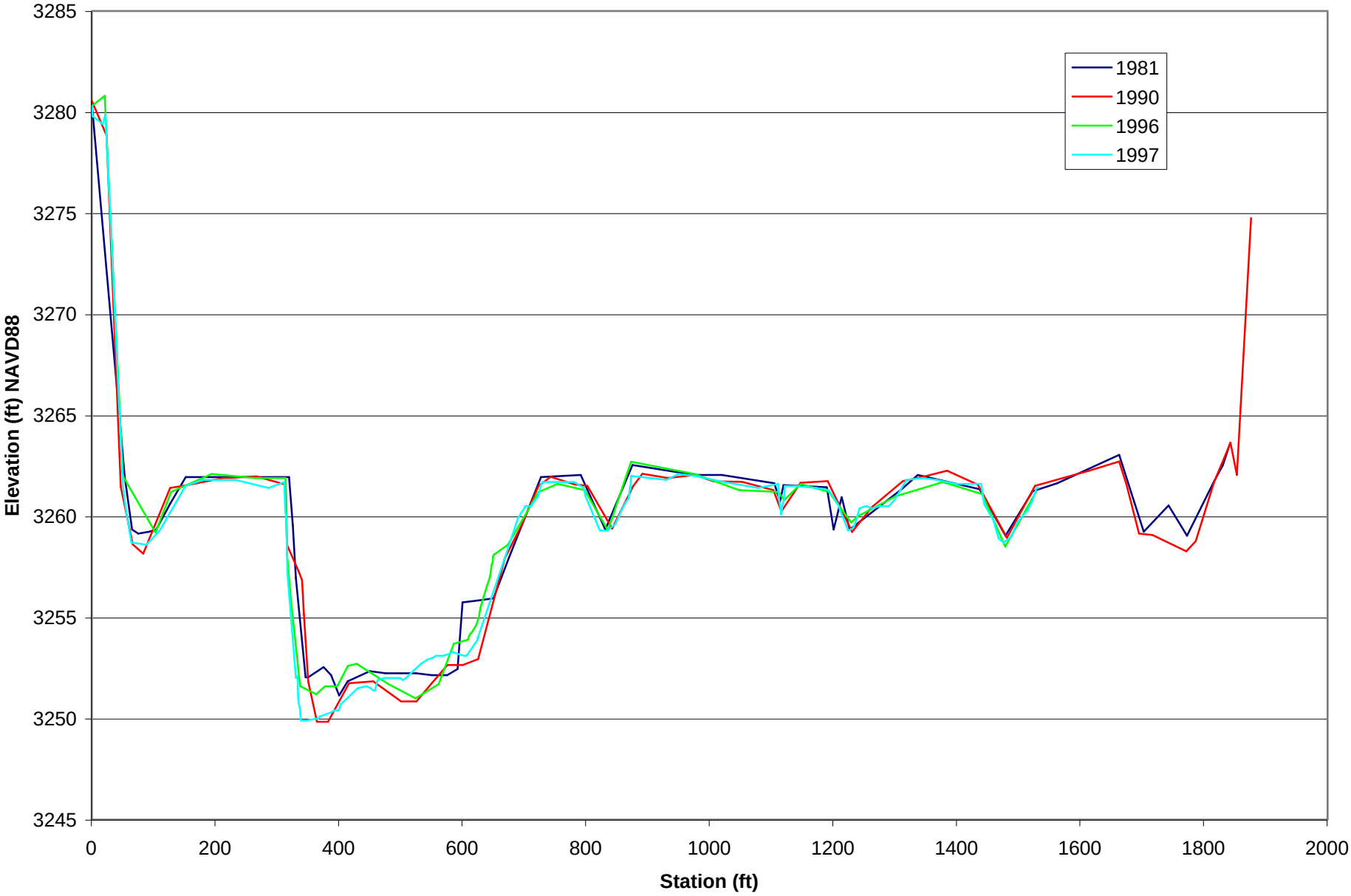

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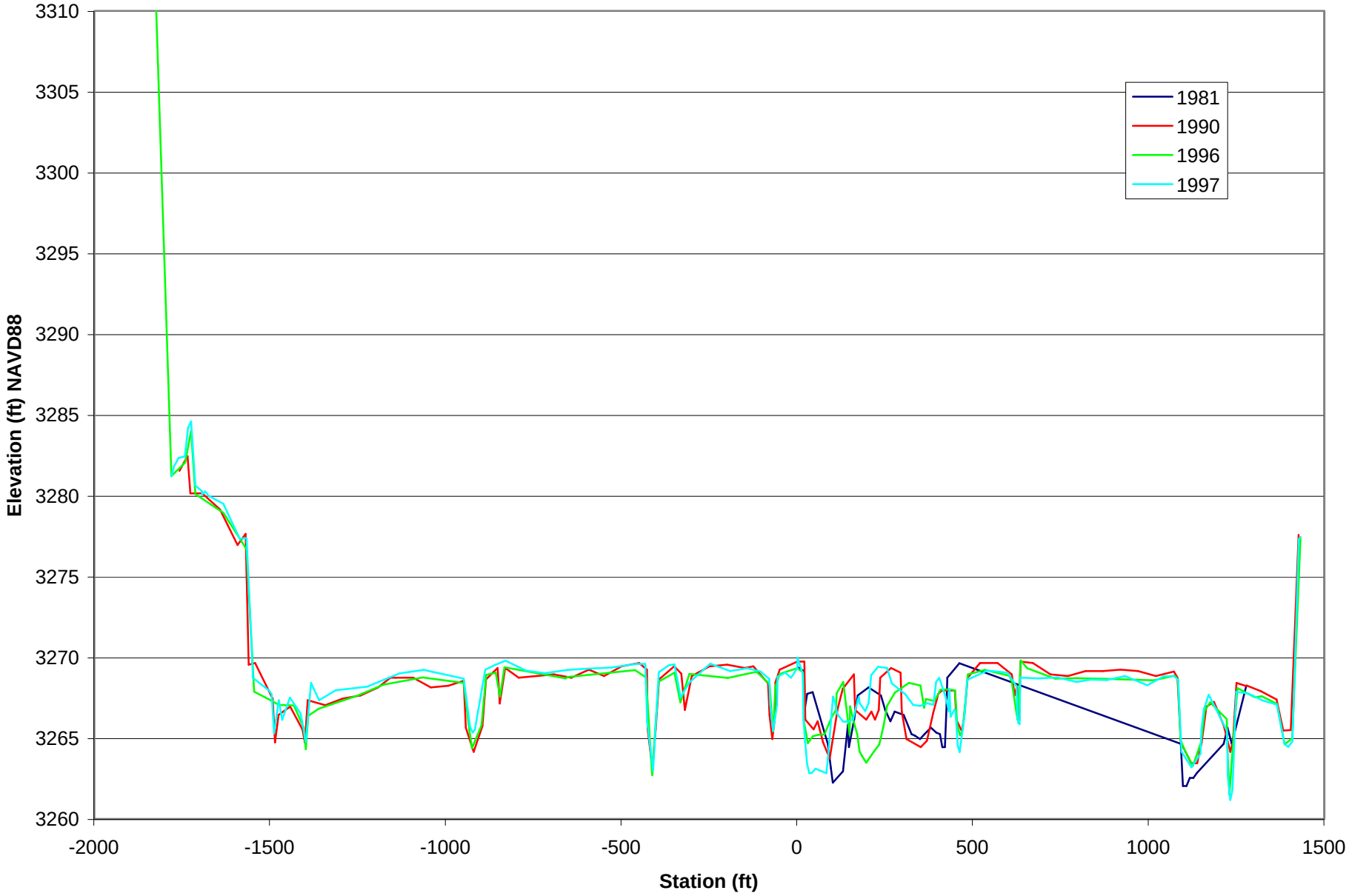
Figure 2-3b
Geomorphic Evolution of Cross-Section O, 1981 - 1997



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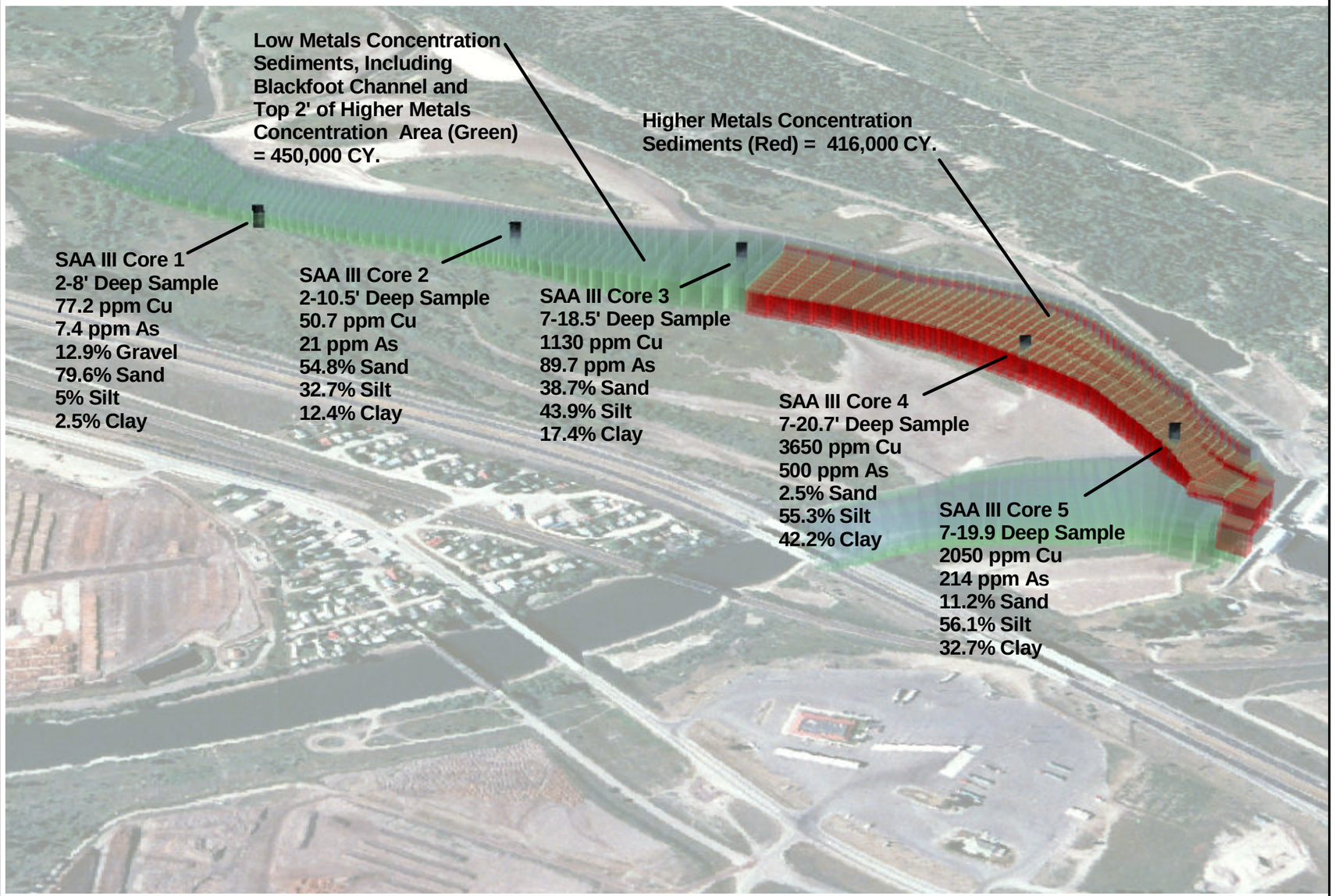

Notes:

1) Core sample information provided for deepest reservoir sediment sample collected during EPA's 2002 field investigation.

2) See Appendix A for additional information on reservoir sediment lithology, including core logs.

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SAA III SEDIMENT PROPERTIES MILLTOWN RESERVOIR SEDIMENTS SITE

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FIGURE 2-4

Revision 1

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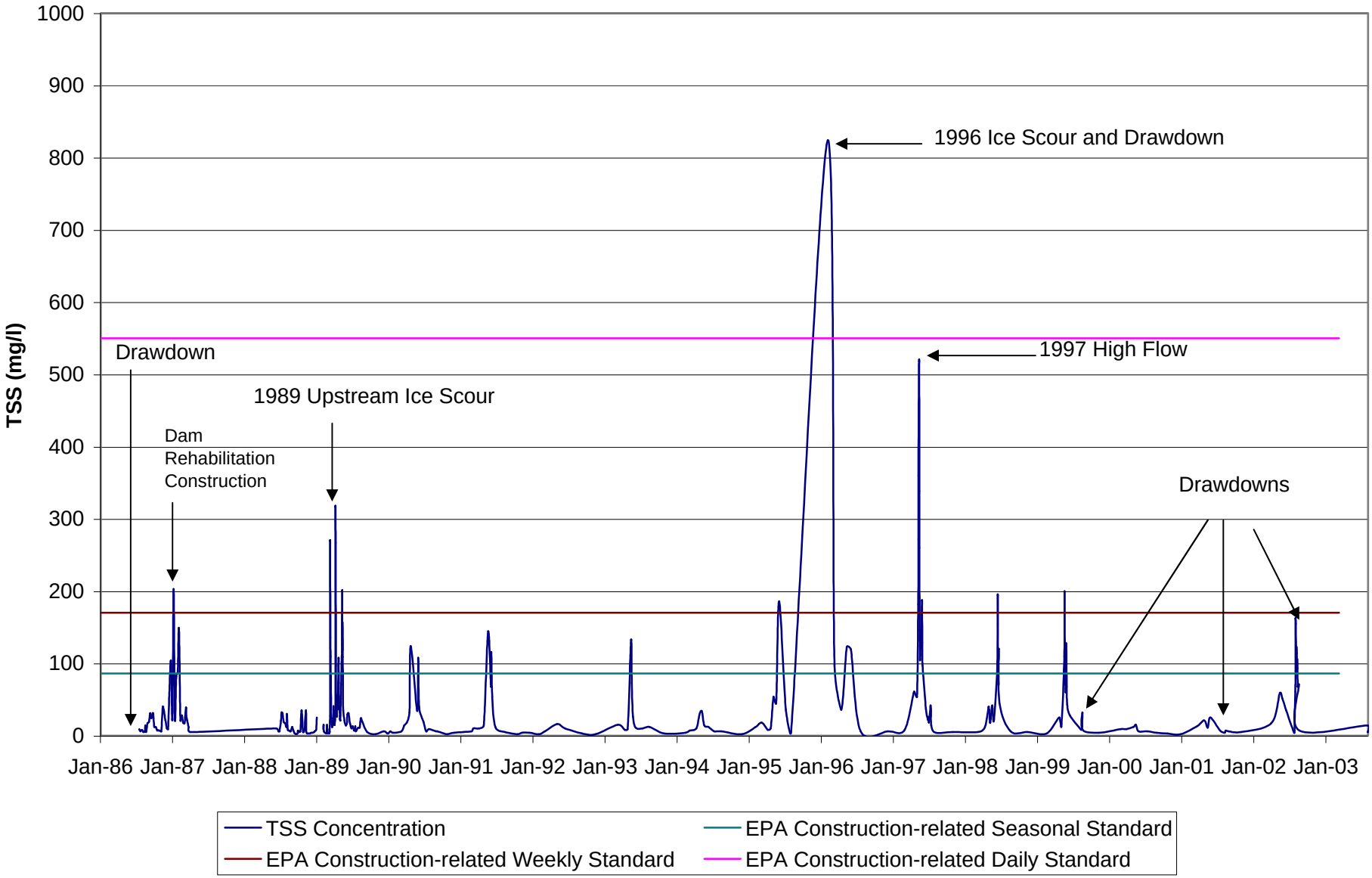
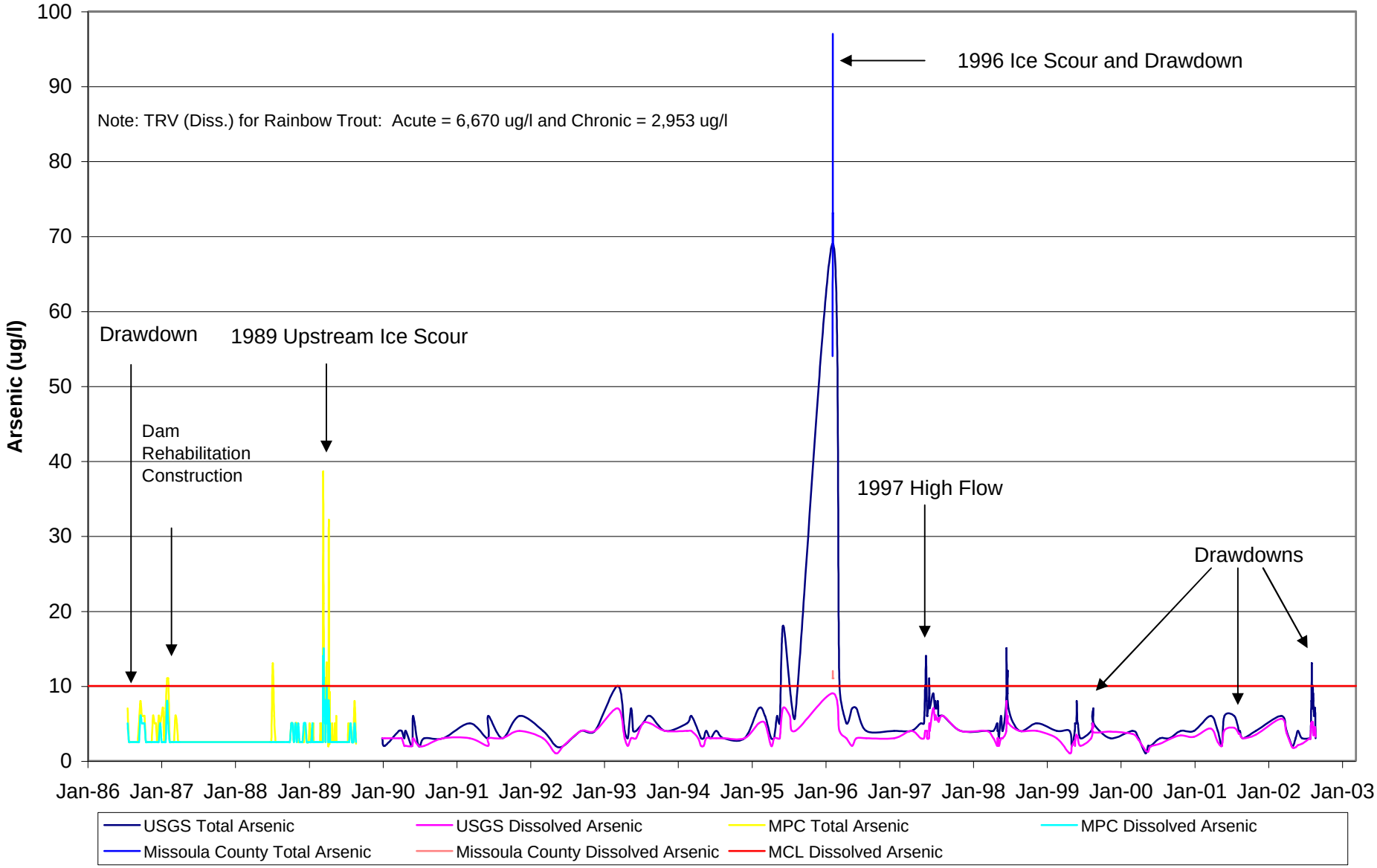
Dwg. No: Fig2-4

Figure 3-1
Historic TSS Concentrations at Above Missoula Station



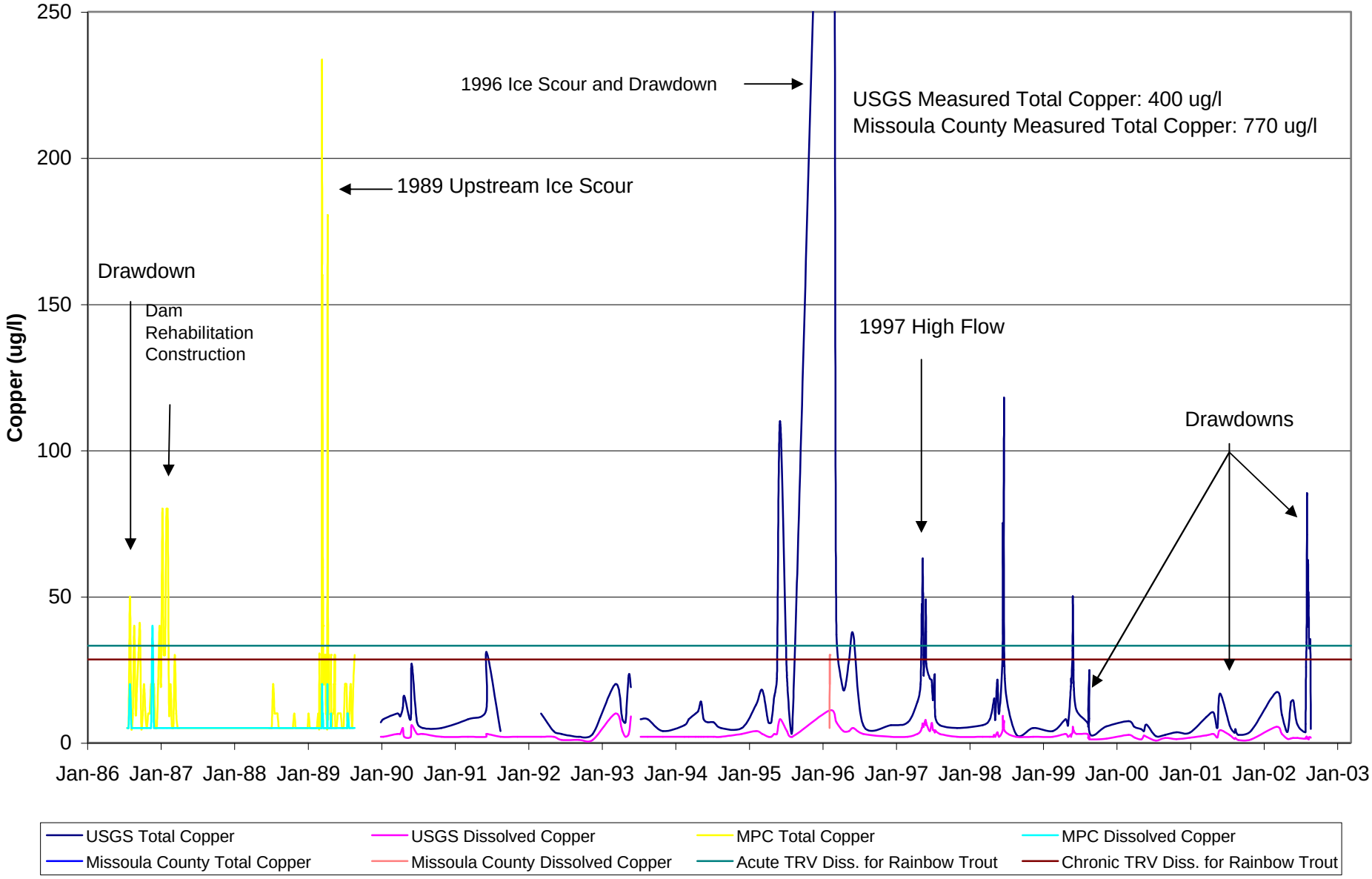
TSS concentration a compilation of MPC-collected data (Land and Water, 1999), USGS-collected data (USGS website station 12340500) and Land and Water-collected data (Land and Water personal communication 2003)
Fig 3-1 to 3-3 Historical timeline.xls

Figure 3-2
Historic Dissolved and Total Arsenic Concentrations at Above Missoula Station



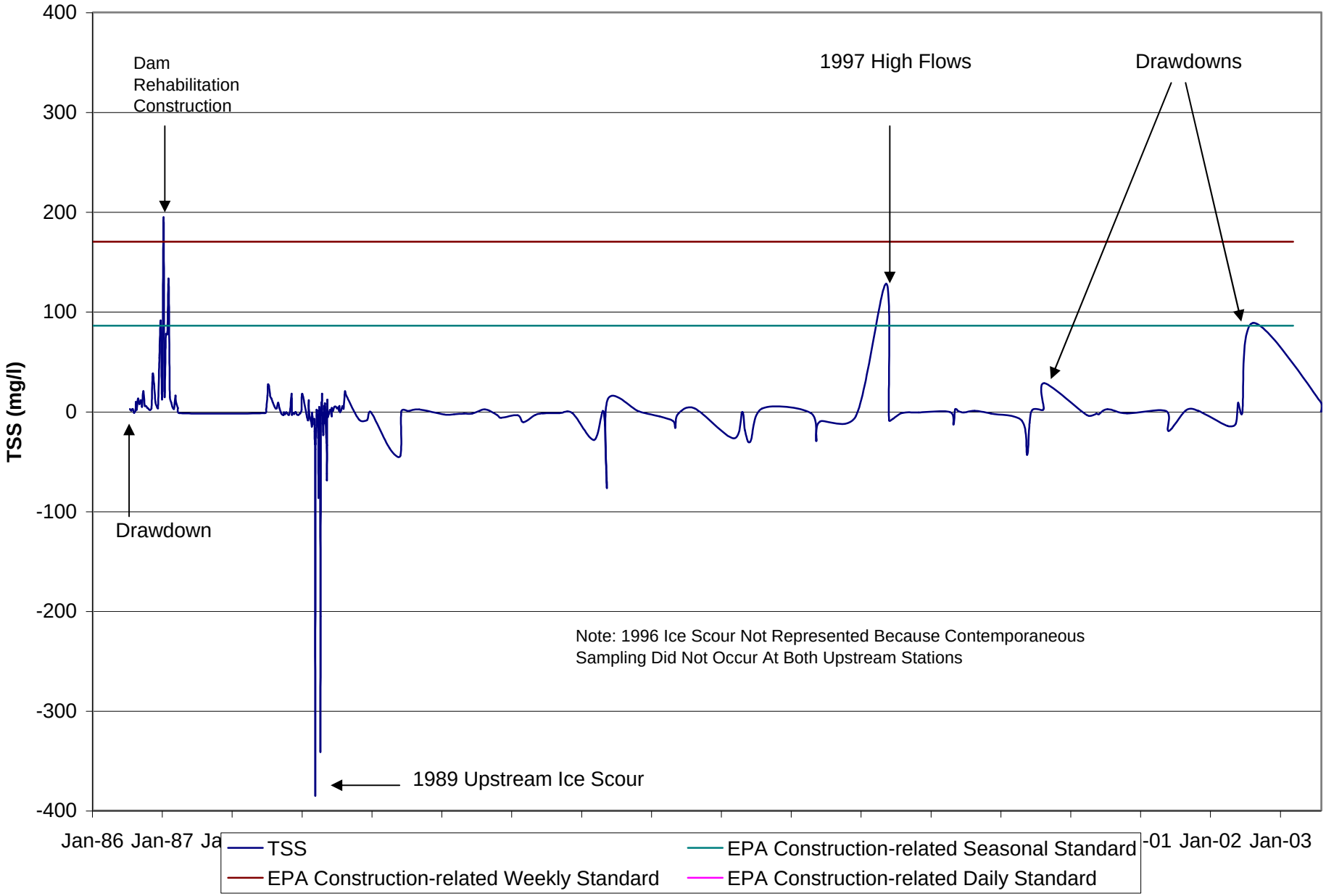
Arsenic concentrations a compilation of MPC-collected data (Land and Water, 1999), USGS-collected data (USGS website station 12340500), and Missoula County-collected data (Atlantic Richfield, 2002)
Fig 3-1 to 3-3 Historical timeline.xls

Figure 3-3
Historic Dissolved and Total Copper Concentrations at Above Missoula Station



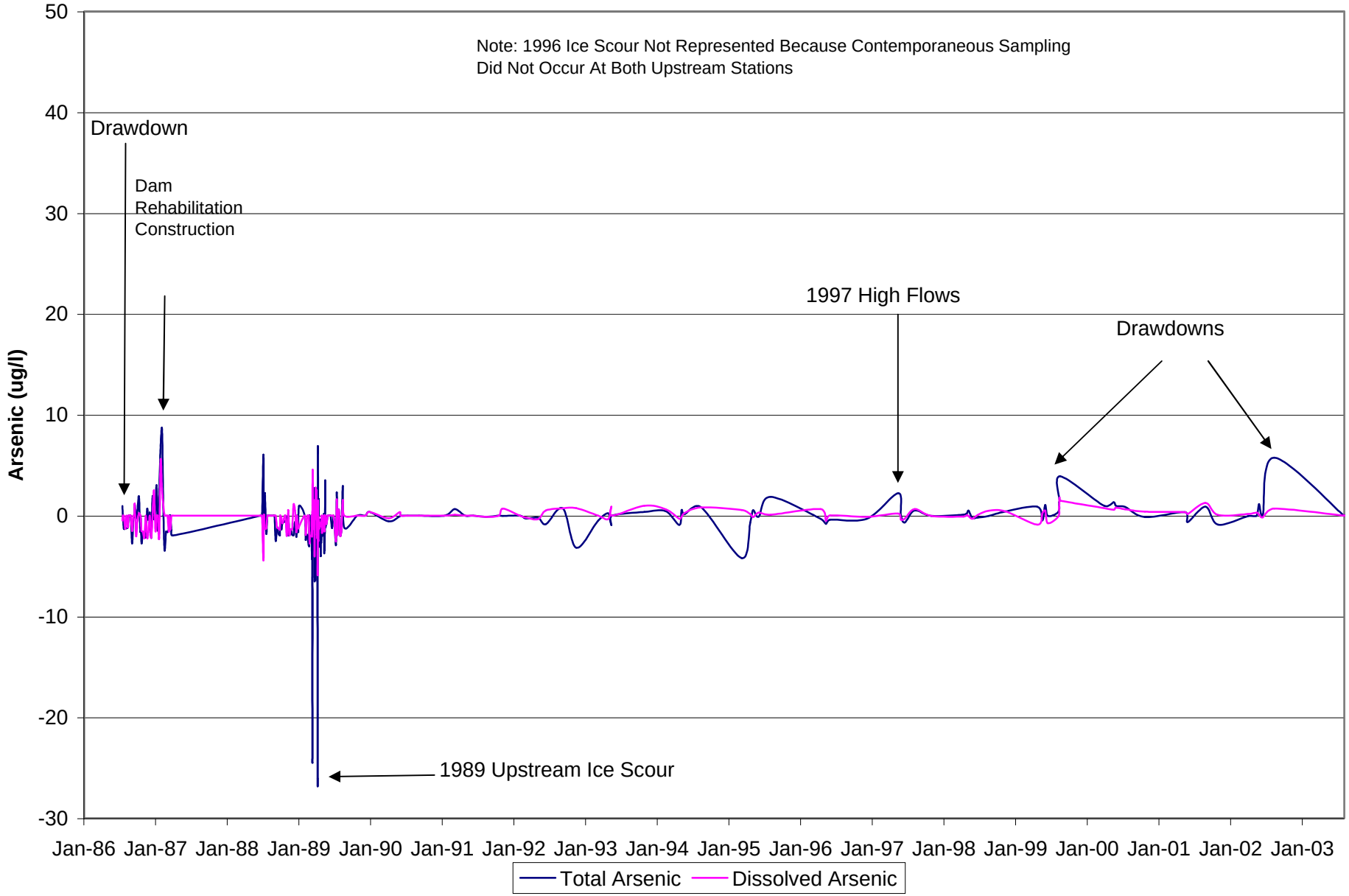
Copper concentrations a compilation of MPC-collected data (Land and Water, 1999), USGS-collected data (USGS website station 12340500), and Missoula County-collected data (Atlantic Richfield, 2002)
Fig 3-1 to 3-3 Historical timeline.xls

Figure 3-4
Historic Incremental TSS Concentrations Due to the Reservoir



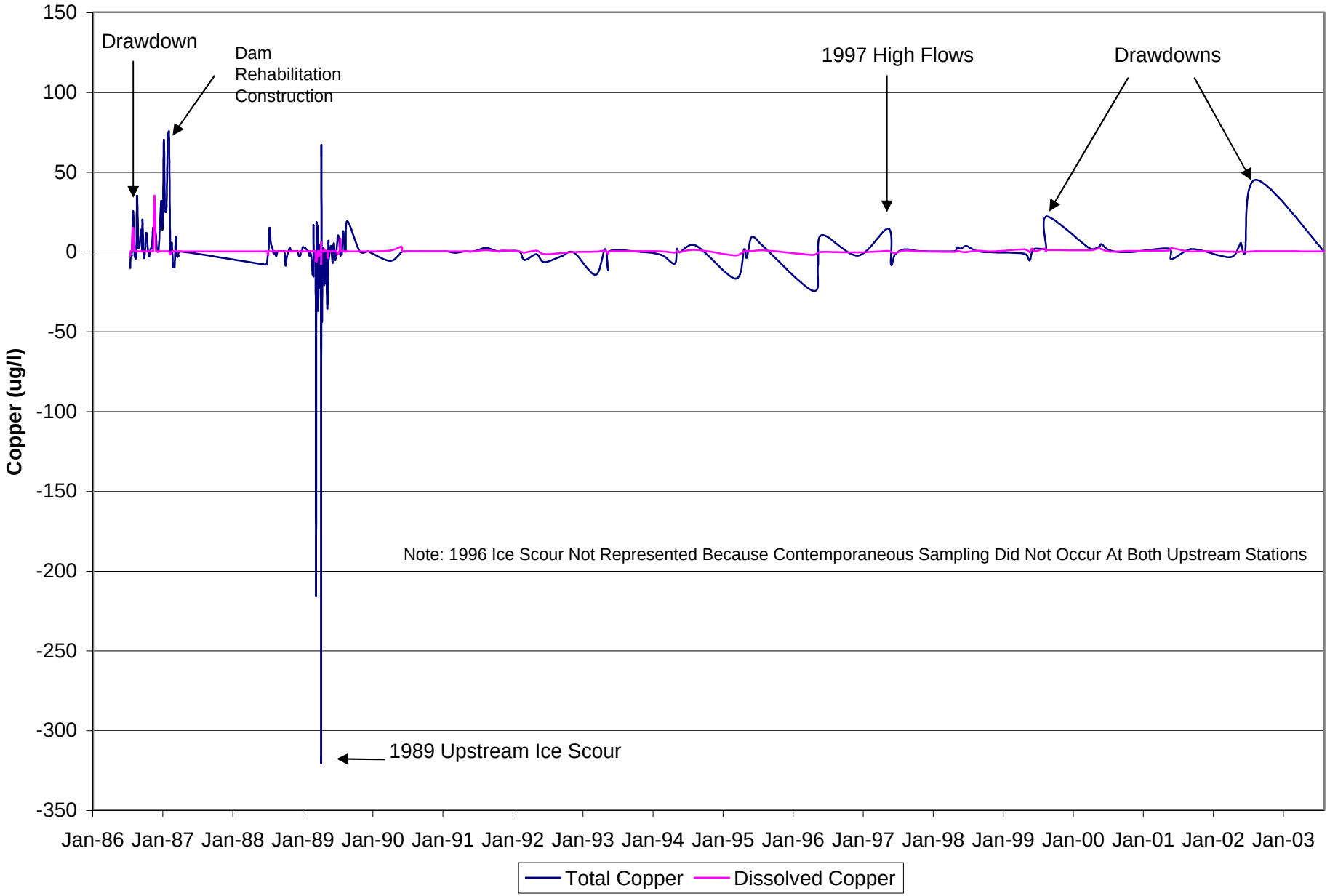
TSS concentration a compilation of MPC-collected data (Land and Water, 1999), USGS-collected data (USGS website stations 12340500, 12334550 and 1234000), and Land and Water-collected data (Land and Water personal communication 2003)
Fig 3-4 to 3-6 Histori

Figure 3-5
Historic Incremental Dissolved and Total Arsenic Concentrations Due to The Reservoir



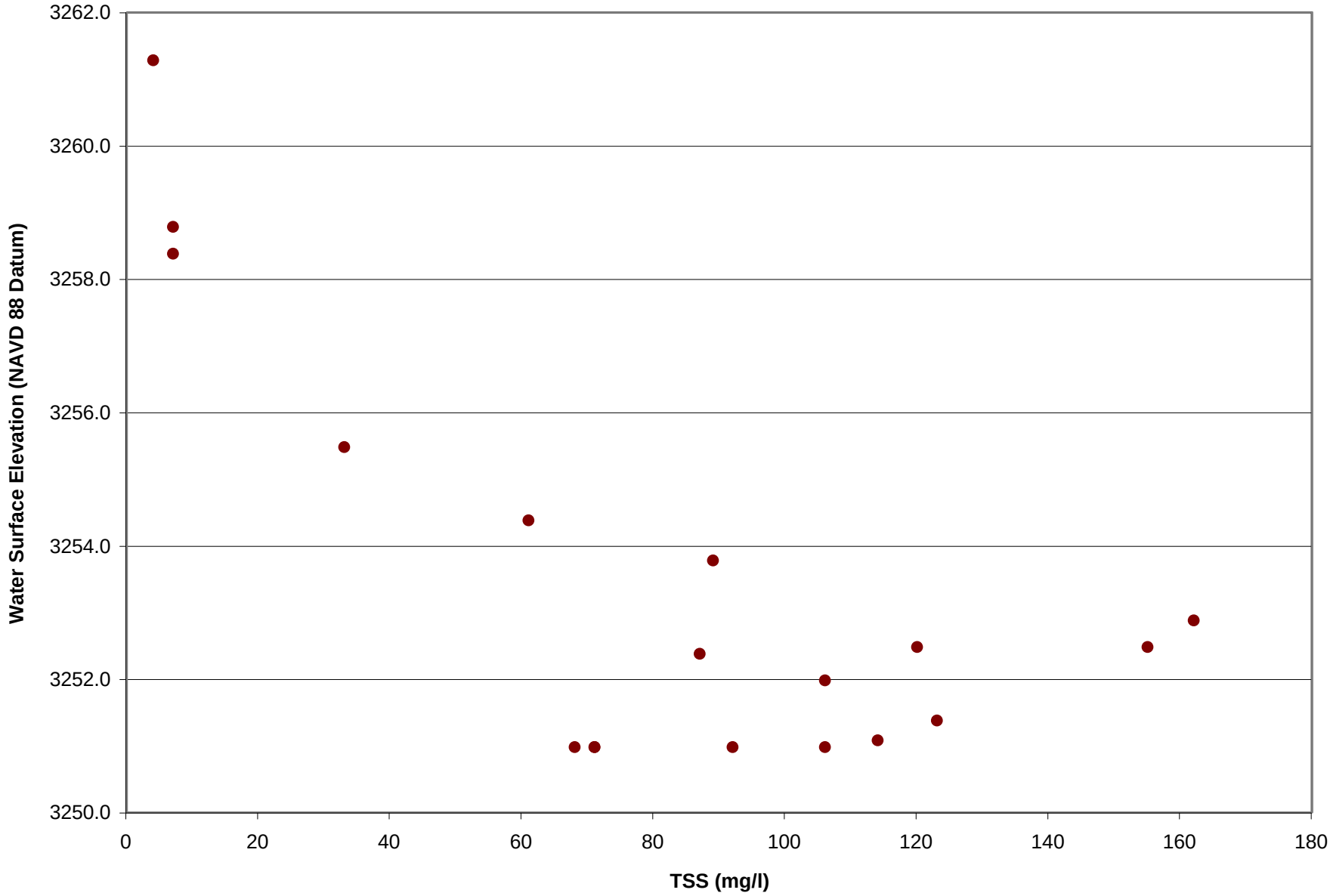
Arsenic concentrations a compilation of MPC-collected data (Land and Water, 1999), USGS-collected data (USGS website stations 12340500, 12334550 and 1234000), and Land and Water-collected data (Land and Water personal communication 2003)
Fig 3-4 to 3-6 Hi

Figure 3-6
Historic Incremental Dissolved and Total Copper Concentrations Due to the Reservoir



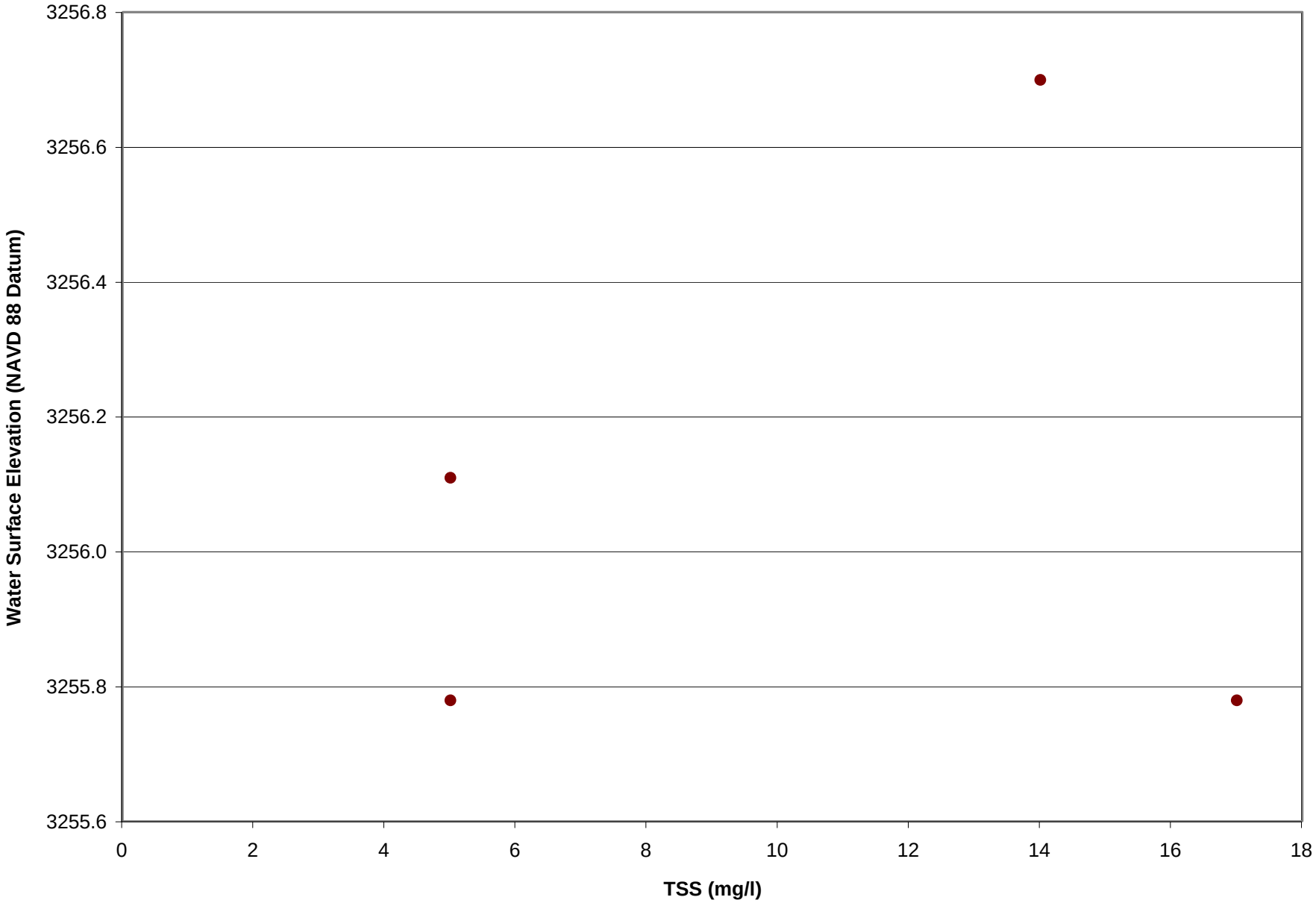
Copper concentrations a compilation of MPC-collected data (Land and Water, 1999), USGS-collected data (USGS website stations 12340500, 12334550 and 1234000), and Land and Water-collected data (Land and Water personal communication 2003)
Fig 3-4 to 3-6 His

Figure 3-7
Reservoir Pool Elevation Versus Measured TSS Concentrations at CFR Above Missoula Station During 2002 Drawdown

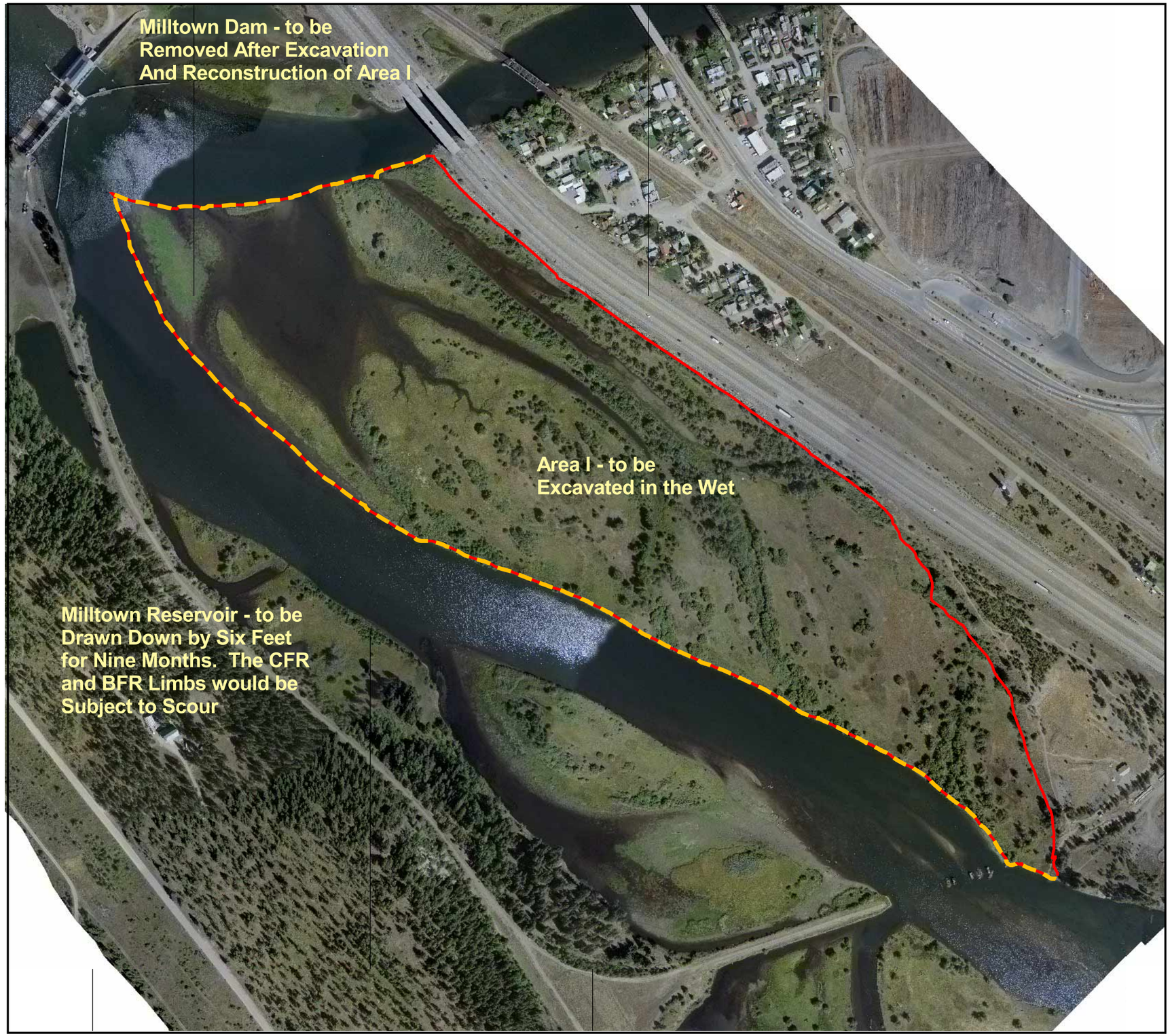


TSS and water surface elevations a compilation of USGS-collected data (USGS website station 123405000) and NorthWestern Energy-collected data (NorthWestern Energy personal communication 2003)
Fig 3-7,8 2002 drawdown.xls

Figure 3-8
Reservoir Pool Elevation Versus Measured TSS Concentrations at CFR Above Missoula Station During 2003 Drawdown



TSS concentration and water surface elevation a compilation of Land and Water-collected data (Land and Water personal communication 2003) and NorthWestern Energy-collected data (NorthWestern Energy personal communication 2003)
Fig 3-7,8 2002 drawdown.xl



Legend

- Area I Boundary
- Sheetpile Wall

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SCALE IN FEET

400 0 400

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Milltown Reservoir Remediation Scenario 2
EPA Proposed Plan

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FIGURE 4-1

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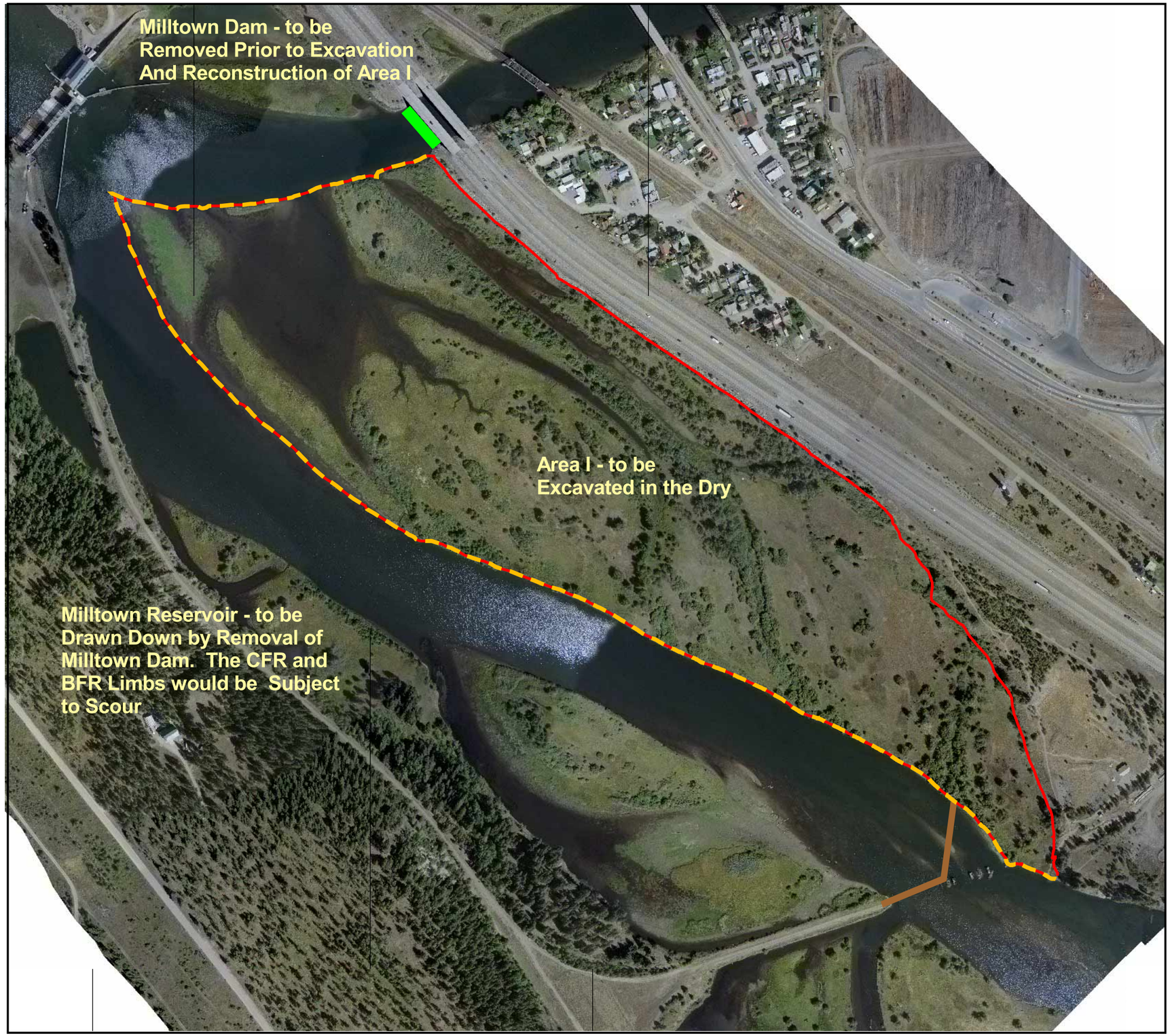

Legend

- Area I Boundary
- Sheetpile Wall or Flood Control Berm
- Diversion Dike/ Road Berm
- Grade Control Structure on Blackfoot River at I-90

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Milltown Reservoir Remediation scenario 3
Dam Removal Without Bypass

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FIGURE 4-2

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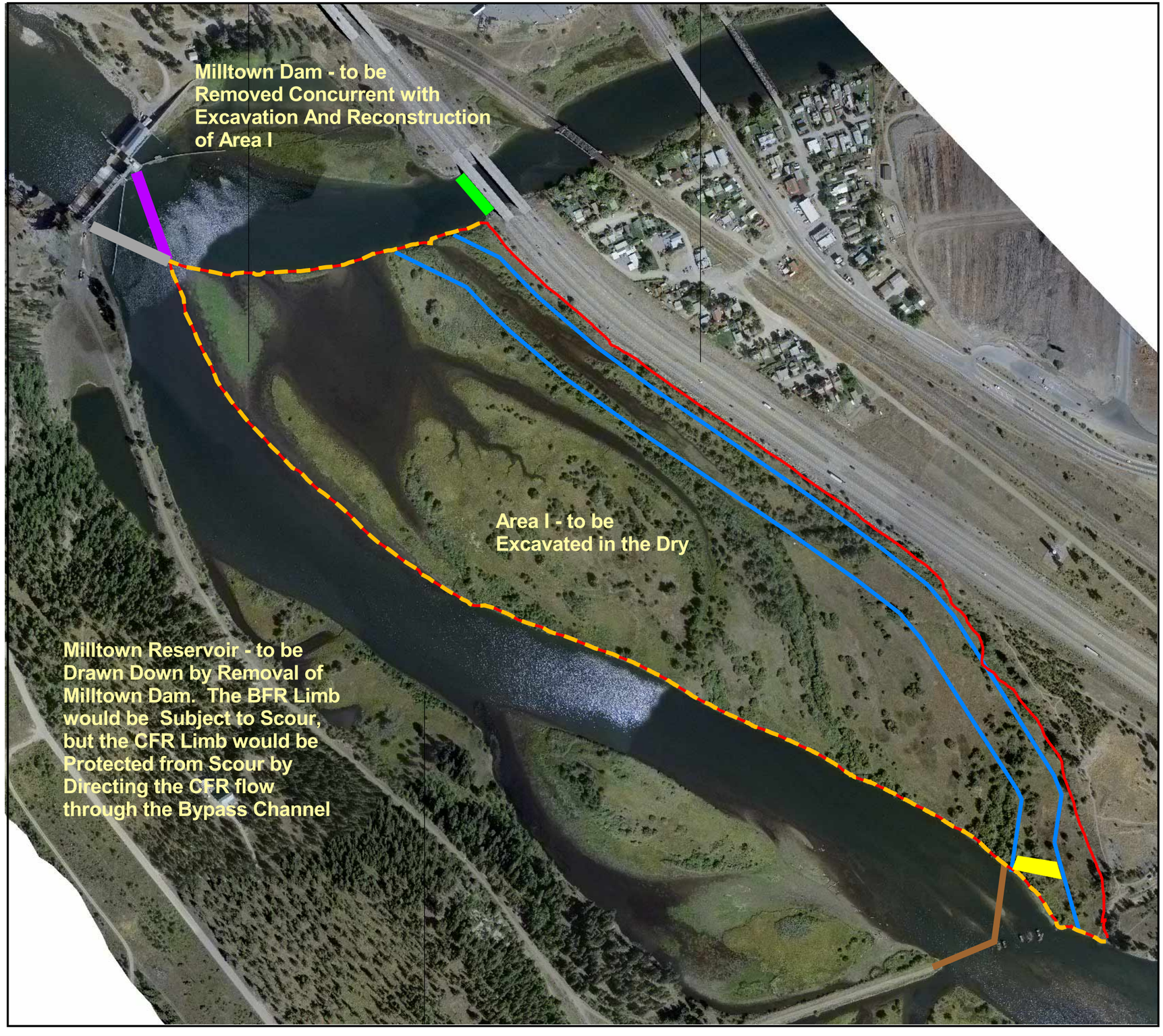

Legend

- Area I Boundary
- Sheetpile Wall or Flood Control Berm
- Top of Bank - Northern Bypass Channel
- Drop Structure in Bypass Channel
- Diversion Dike/ Road Berm
- Grade Control Structure on Blackfoot River at I-90
- Cofferdam
- Earthen Berm

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Milltown Reservoir Remediation Scenario 4 Dam Removal With Full Bypass

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FIGURE 4-3

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Figure 4-4
Milltown Reservoir Water Surface Elevation Immediately Upstream of the Dam
Under Scenario 1

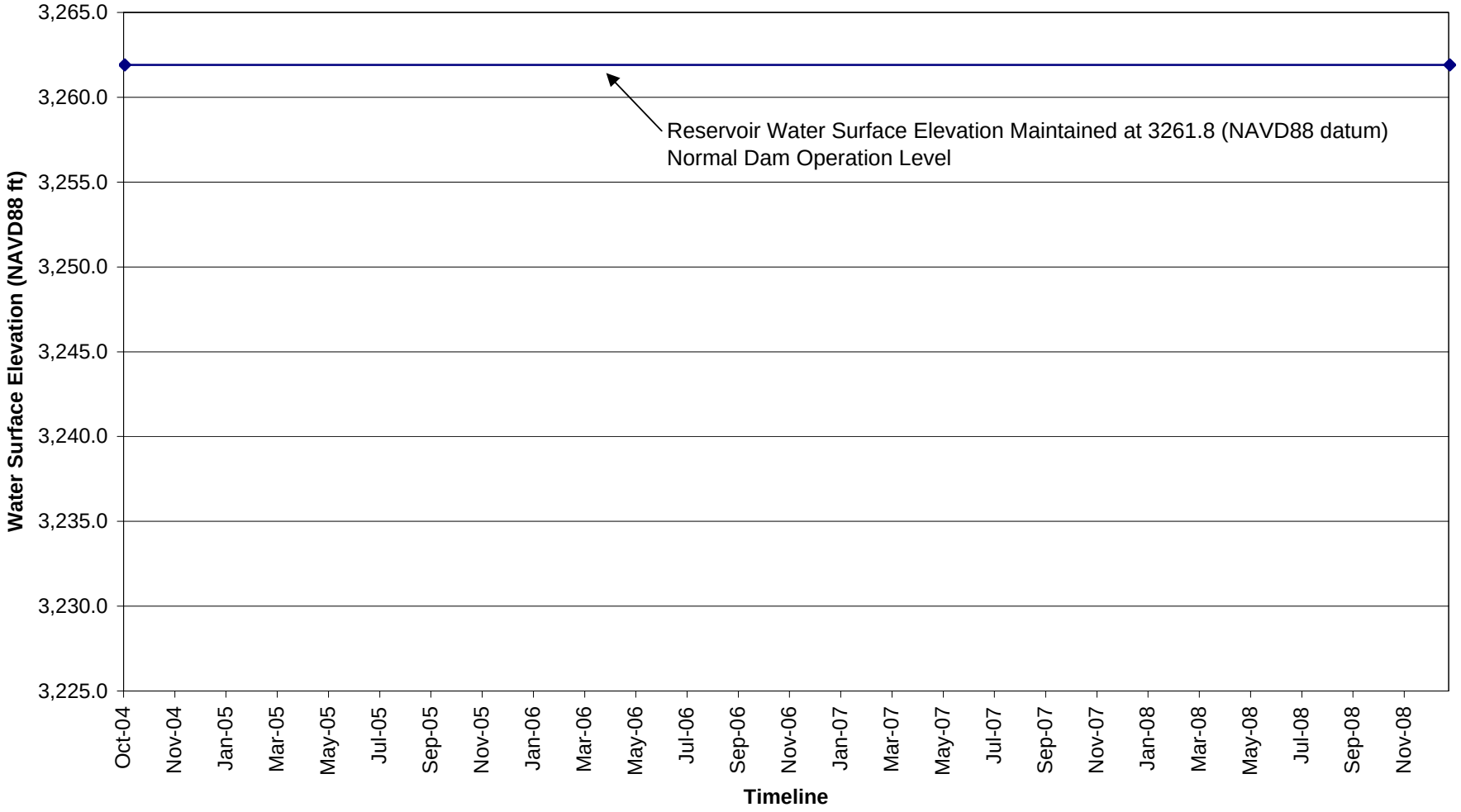

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Figure 4-5
Milltown Reservoir Water Surface Elevation Immediately Upstream of Dam Under Scenario 2

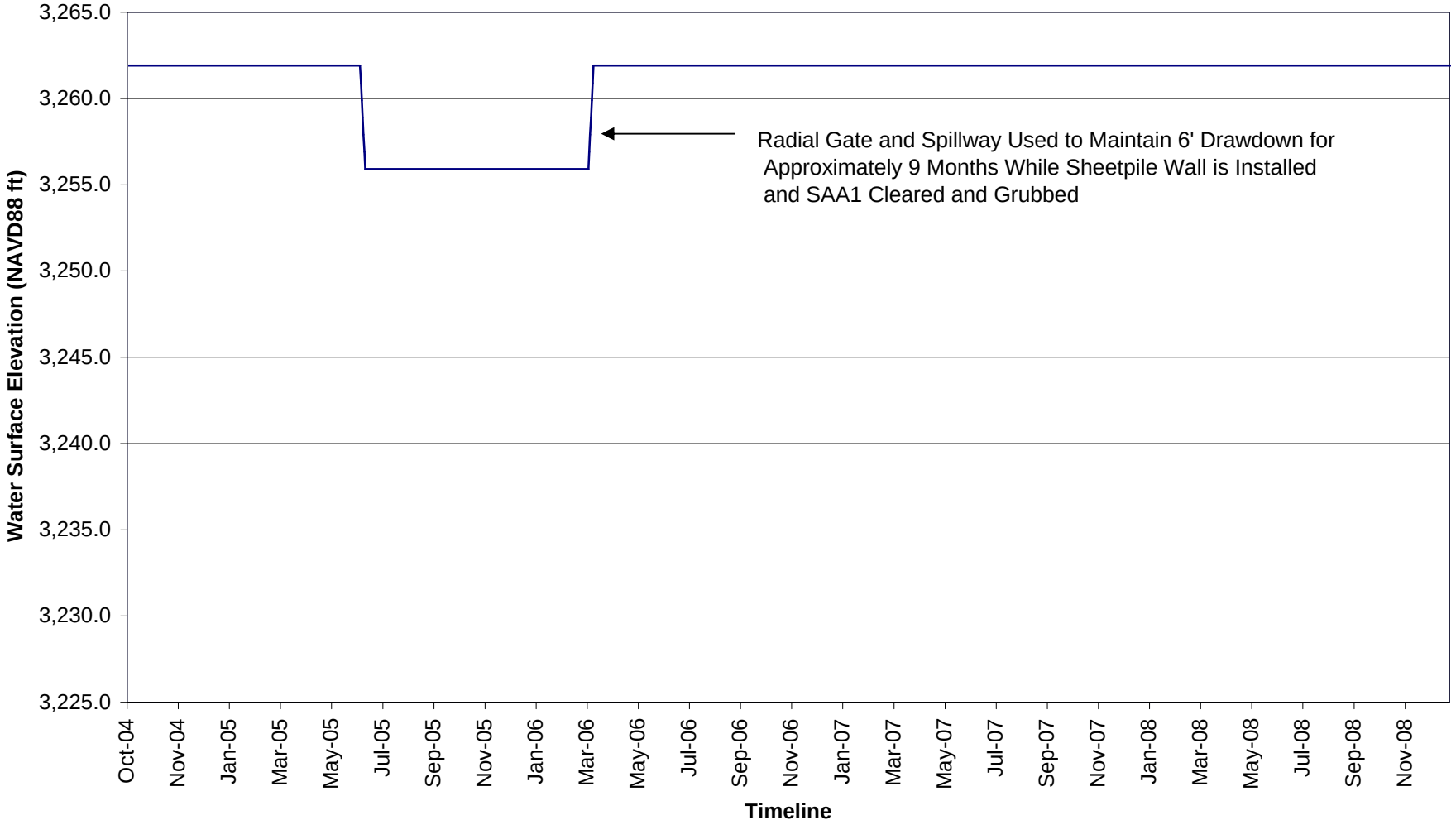


Figure 4-6
Milltown Reservoir Water Surface Elevation at Dam
Under Scenario 3 Dam Removal, Average Flows

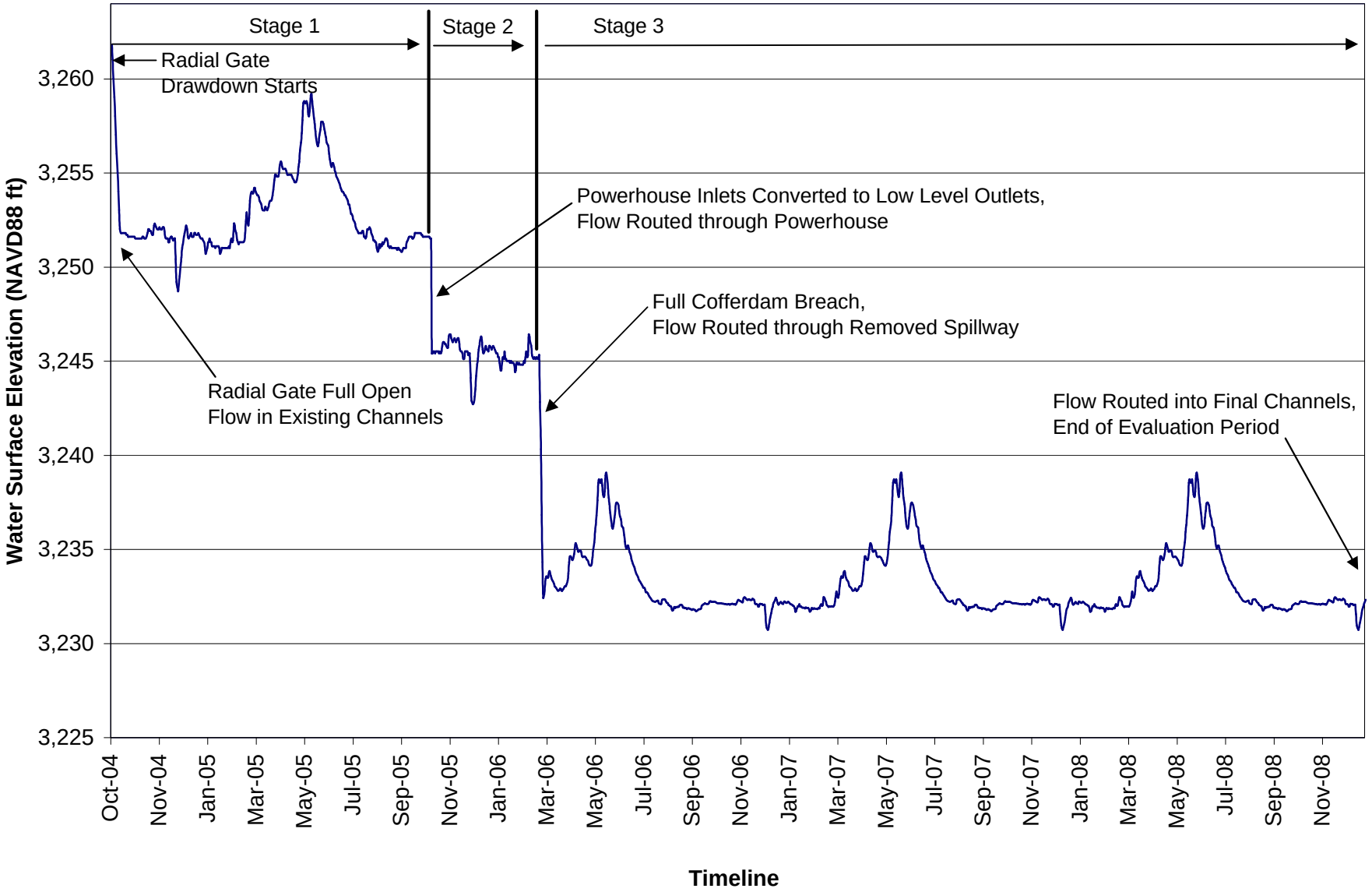
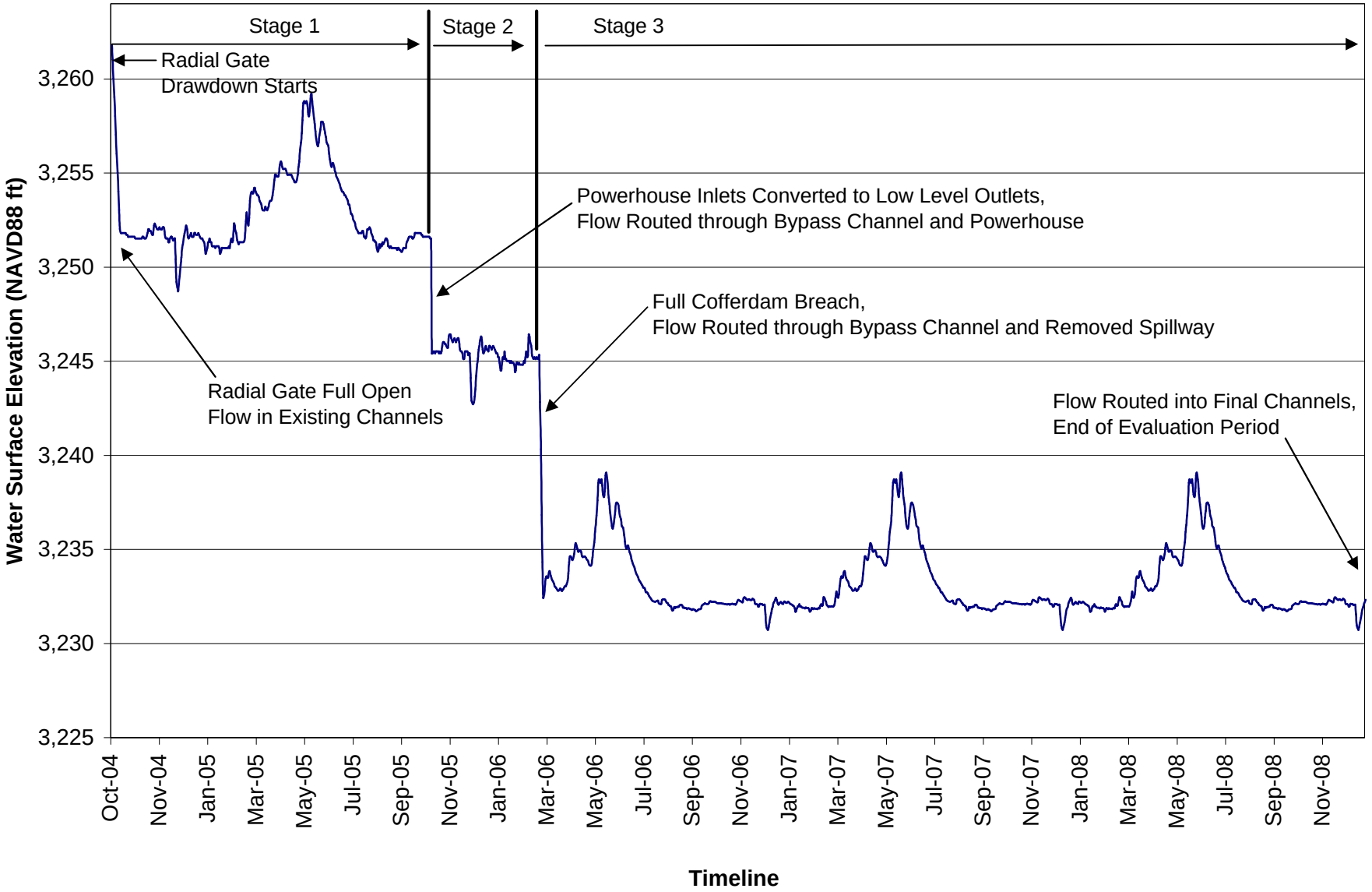
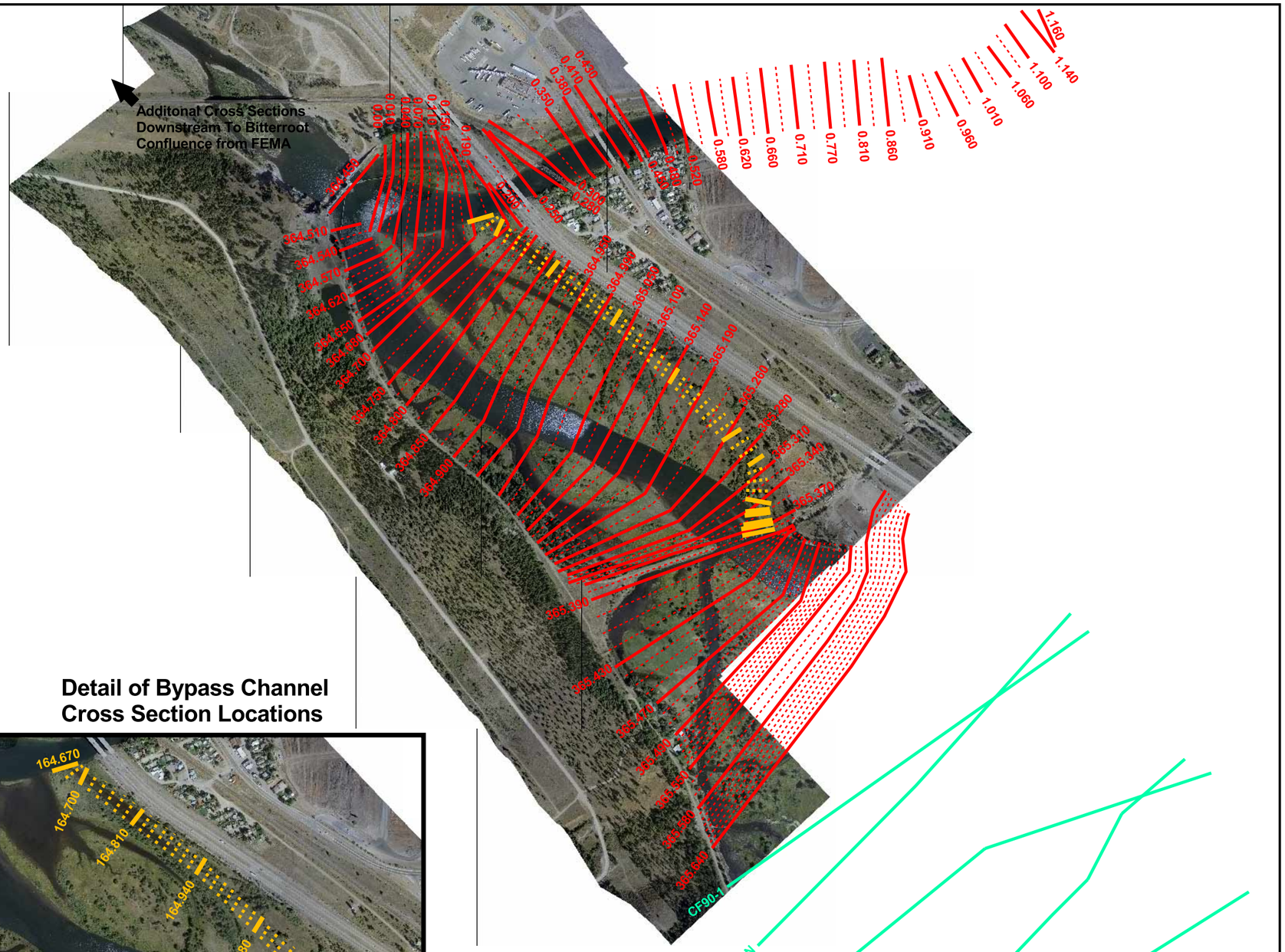


Figure 4-7
Milltown Reservoir Water Surface Elevation at Dam
Under Scenario 4a Dam Removal, Average Flows





Detail of Bypass Channel Cross Section Locations

Legend

- Cross Section Based on 2003 Survey Data
- Cross Section Interpolated from 2003 Survey Data by HECRAS Software
- Cross Section Based on 1997 Survey Data
- Cross Section Based on Bypass Channel Design
- Cross Section Interpolated from Bypass Channel Design by HECRAS Software

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Scour Model Movable Bed Cross Section Locations
Milltown Reservoir Site
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FIGURE 4-8

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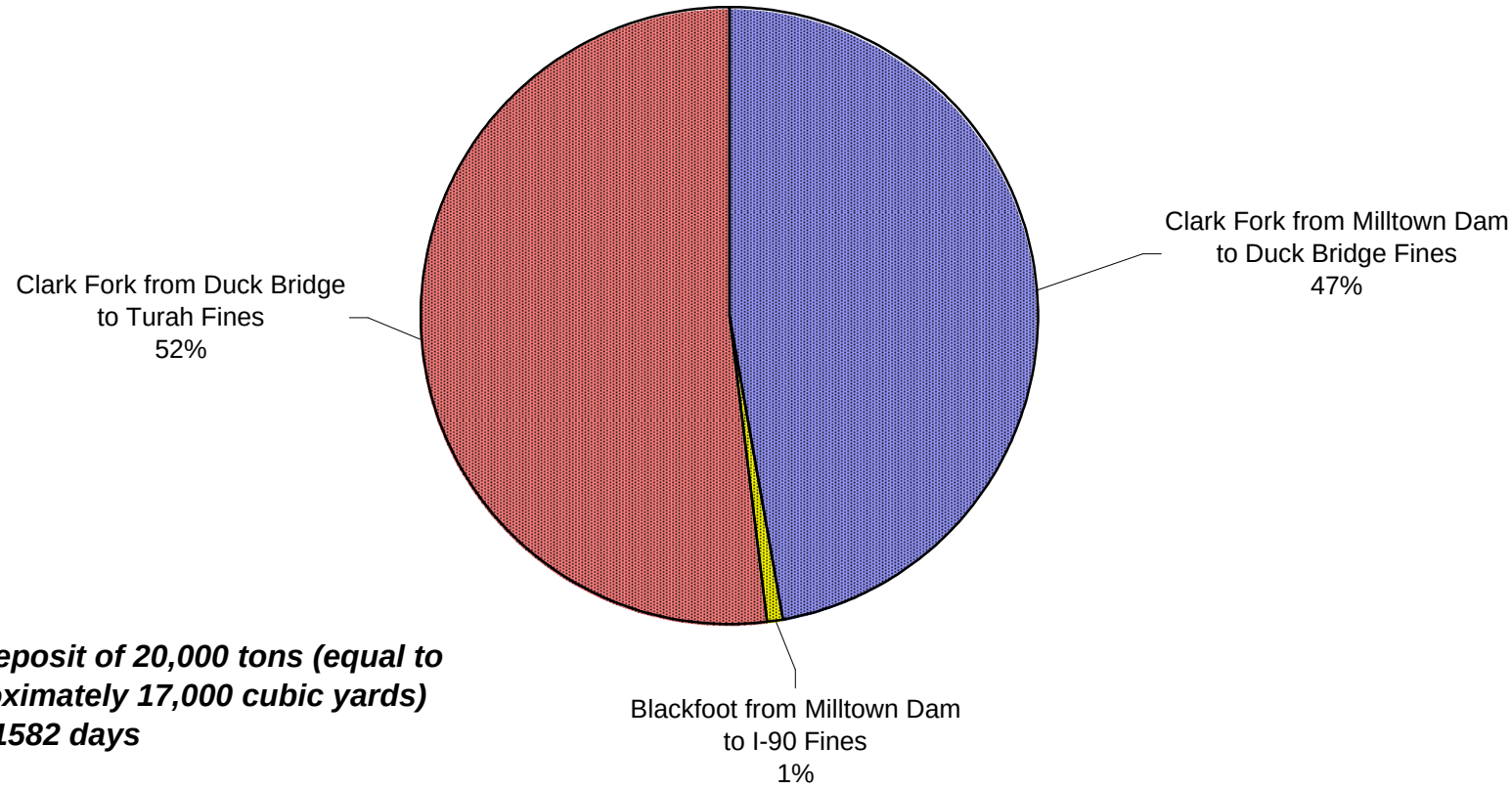
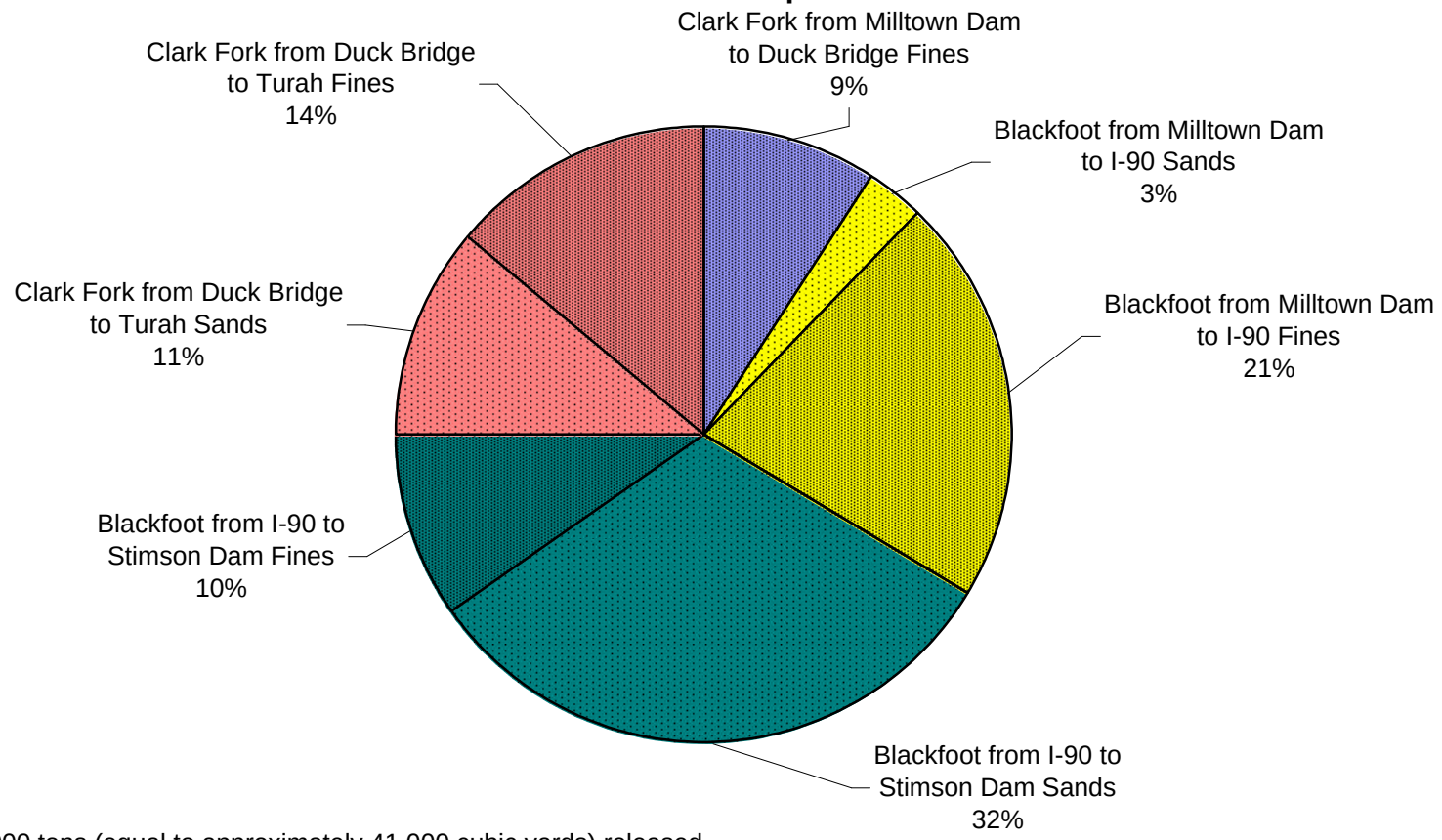
Figure 4-9: Estimated Amount (by weight) of Bed Material Scoured from above Milltown Dam
Scenario 1 - No Action



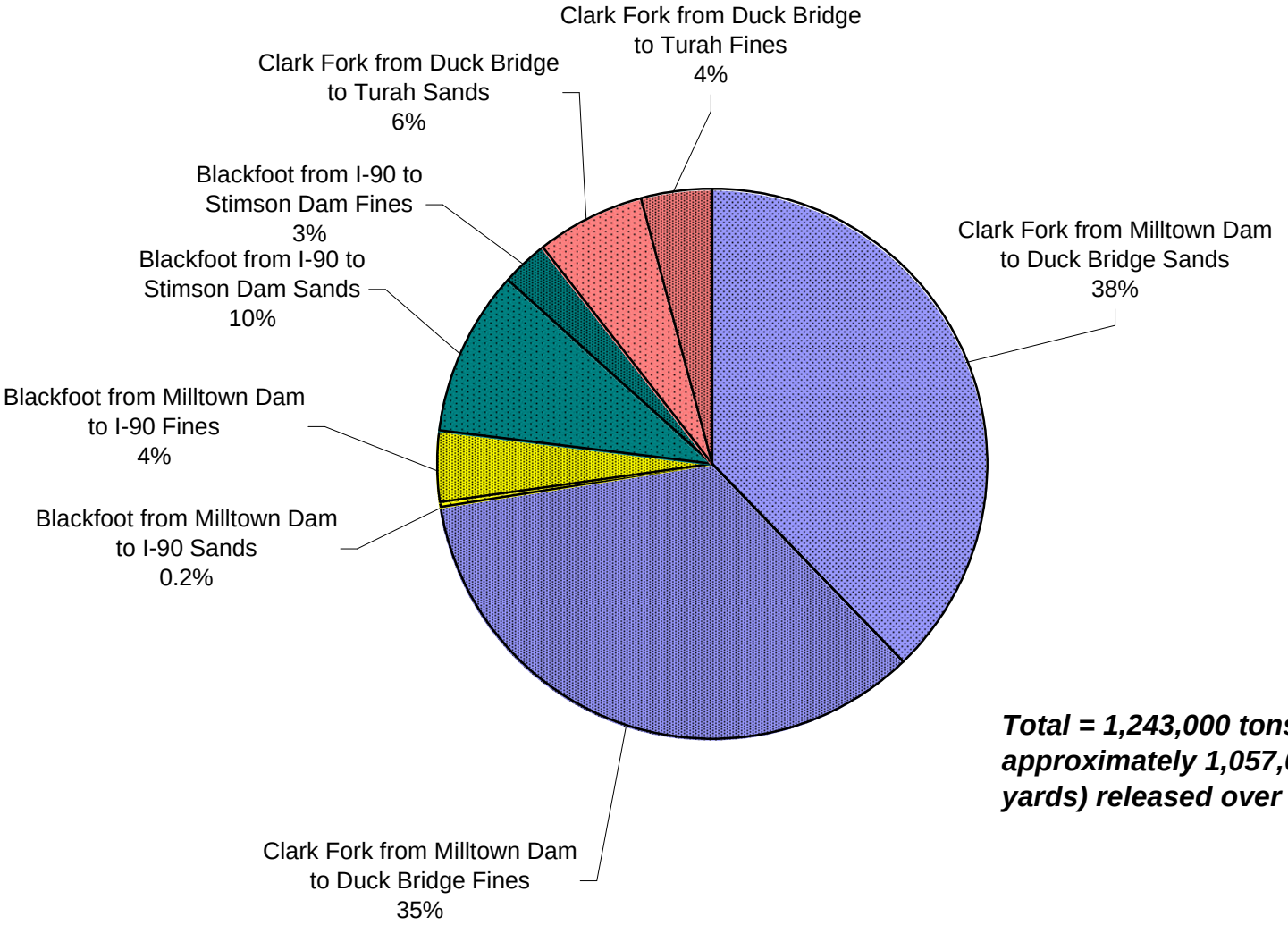
Net deposit of 20,000 tons (equal to approximately 17,000 cubic yards) over 1582 days

Figure 4-10: Estimated Amount (by weight) of Bed Material Scoured from above Milltown Dam
Scenario 2 - EPA's Proposed Plan



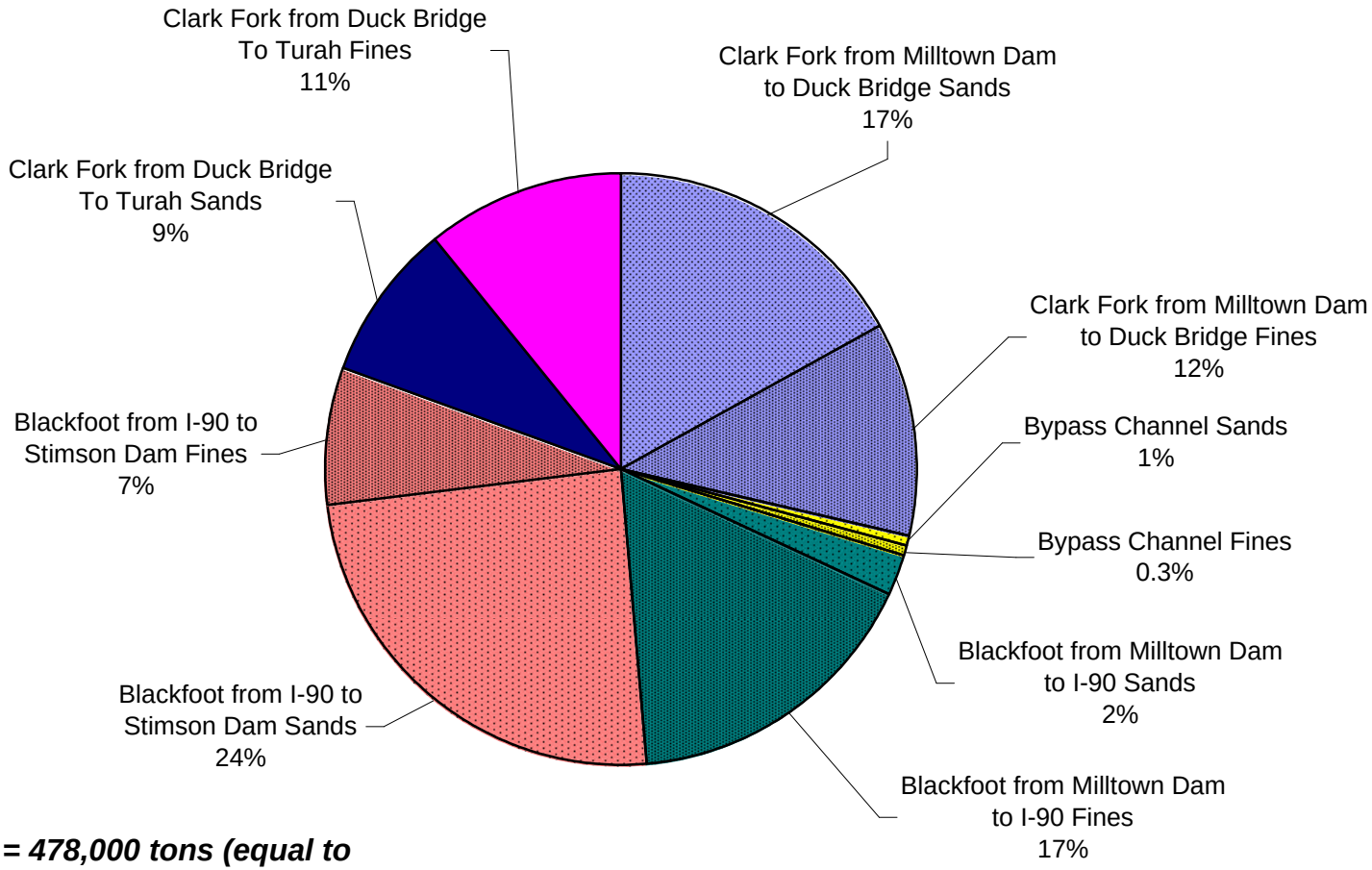
Total = 48,000 tons (equal to approximately 41,000 cubic yards) released over the modeled 1582 day sediment removal period. Note that an additional approximately up to 320,000 tons (equal to approximately 270,000 cubic yards) could be released subsequent to the modeled period when the dam is finally removed. The total modeled period plus additional dam removal scour is reflected in the pie chart percentage breakdown.

Figure 4-11: Estimated Amount (by weight) of Bed Material Scoured from above Milltown Dam
Scenario 3 - Dam Removal without Bypass



Total = 1,243,000 tons (equal to approximately 1,057,000 cubic yards) released over 1582 days

Figure 4-12: Estimated Amount (by weight) of Bed Material Scoured from above Milltown Dam
Scenario 4a - Dam Removal with Full Bypass Channel, Average Flow



Total = 478,000 tons (equal to approximately 406,000 cubic yards) released over 1582 days

Figure 4-13
Comparison of Highest Year Sediment Loads (Including Inflowing) Between Model Scenarios

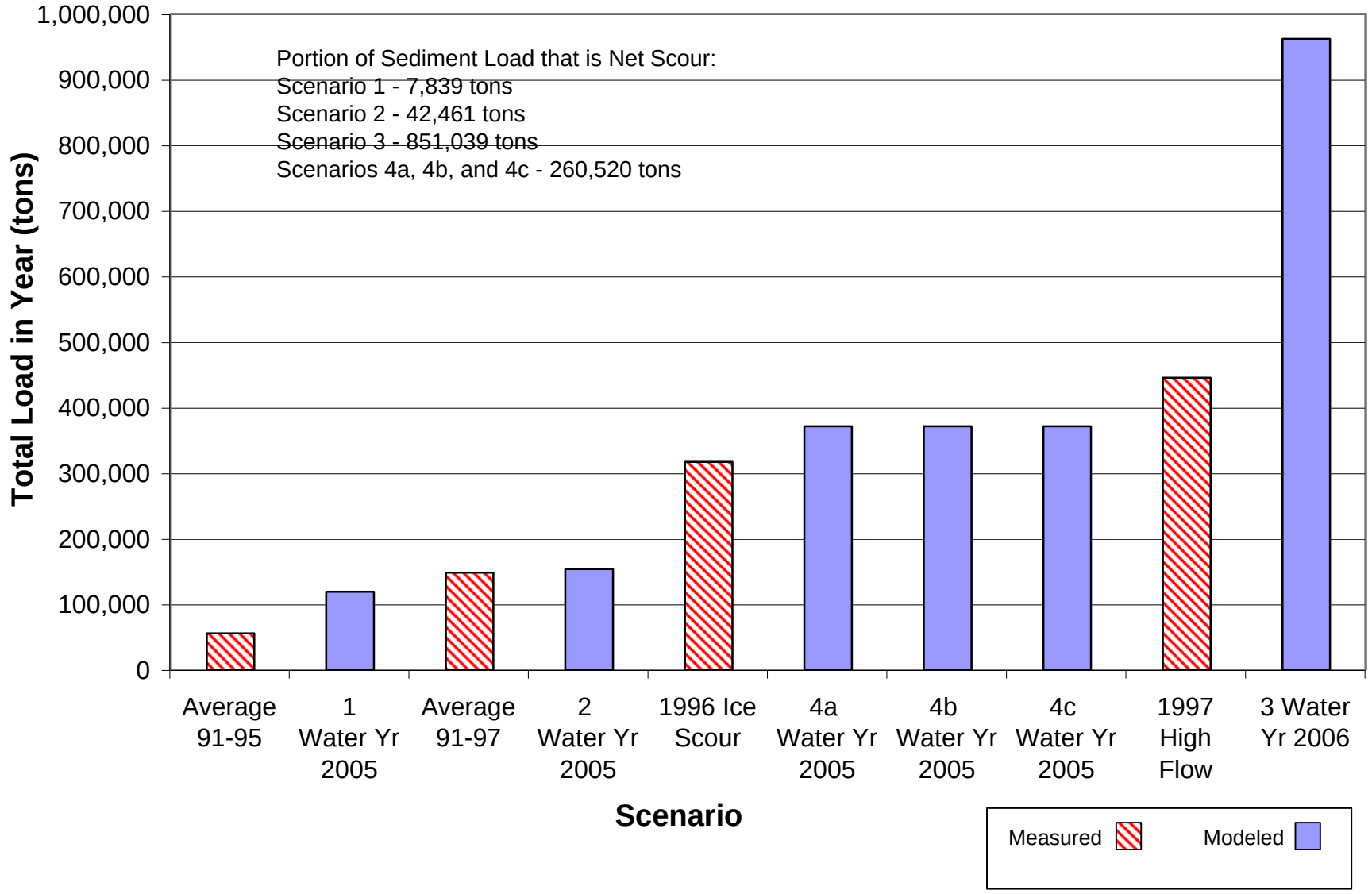


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Figure 4-14
Comparison of Peak Downstream TSS Concentrations Between Model Scenarios

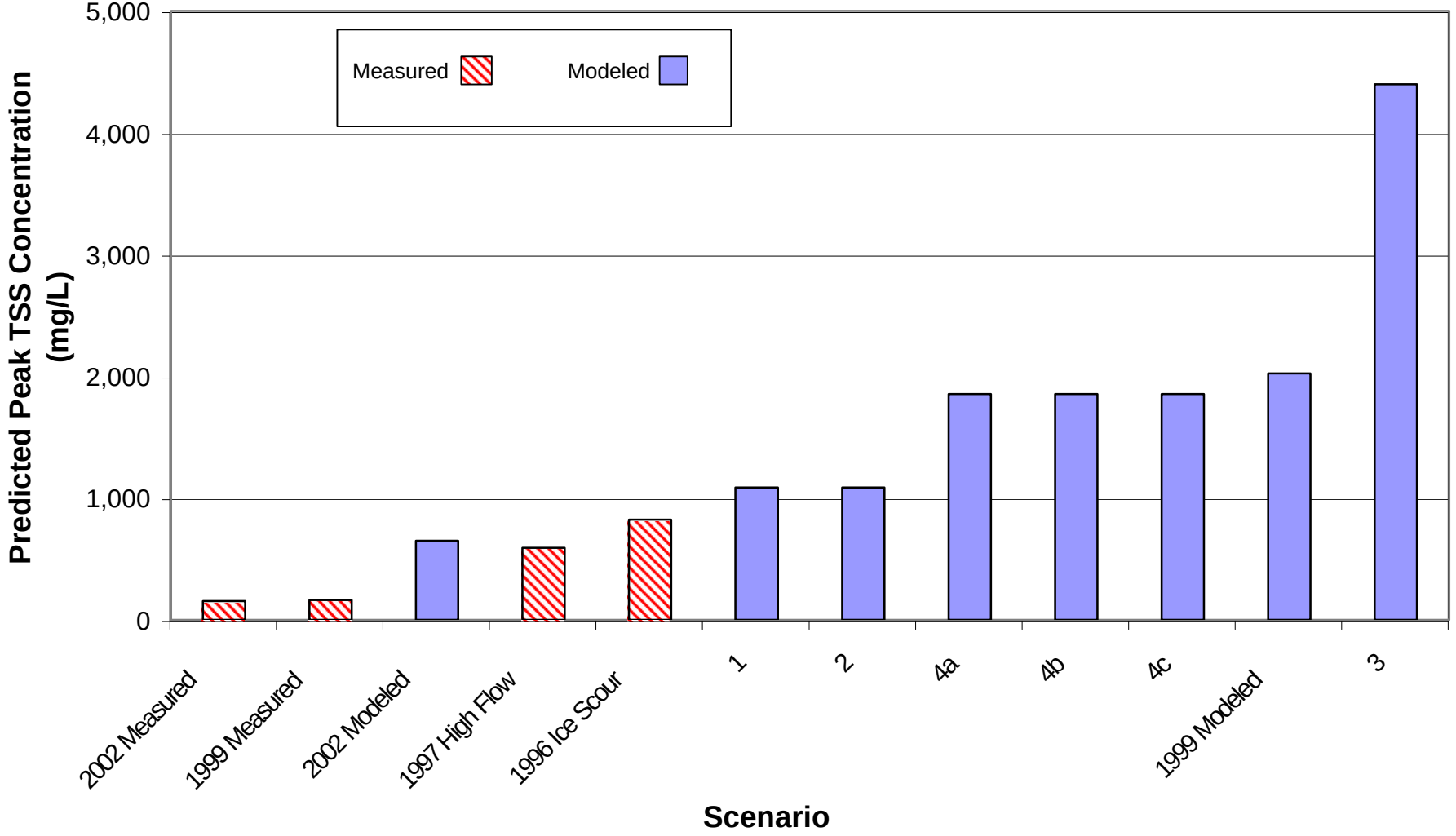

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Figure 4-15: Deposition in Downstream Clark Fork River Reach (Milltown Dam to Bitterroot Confluence) under Scenario 4a Dam Removal with Full Bypass Channel

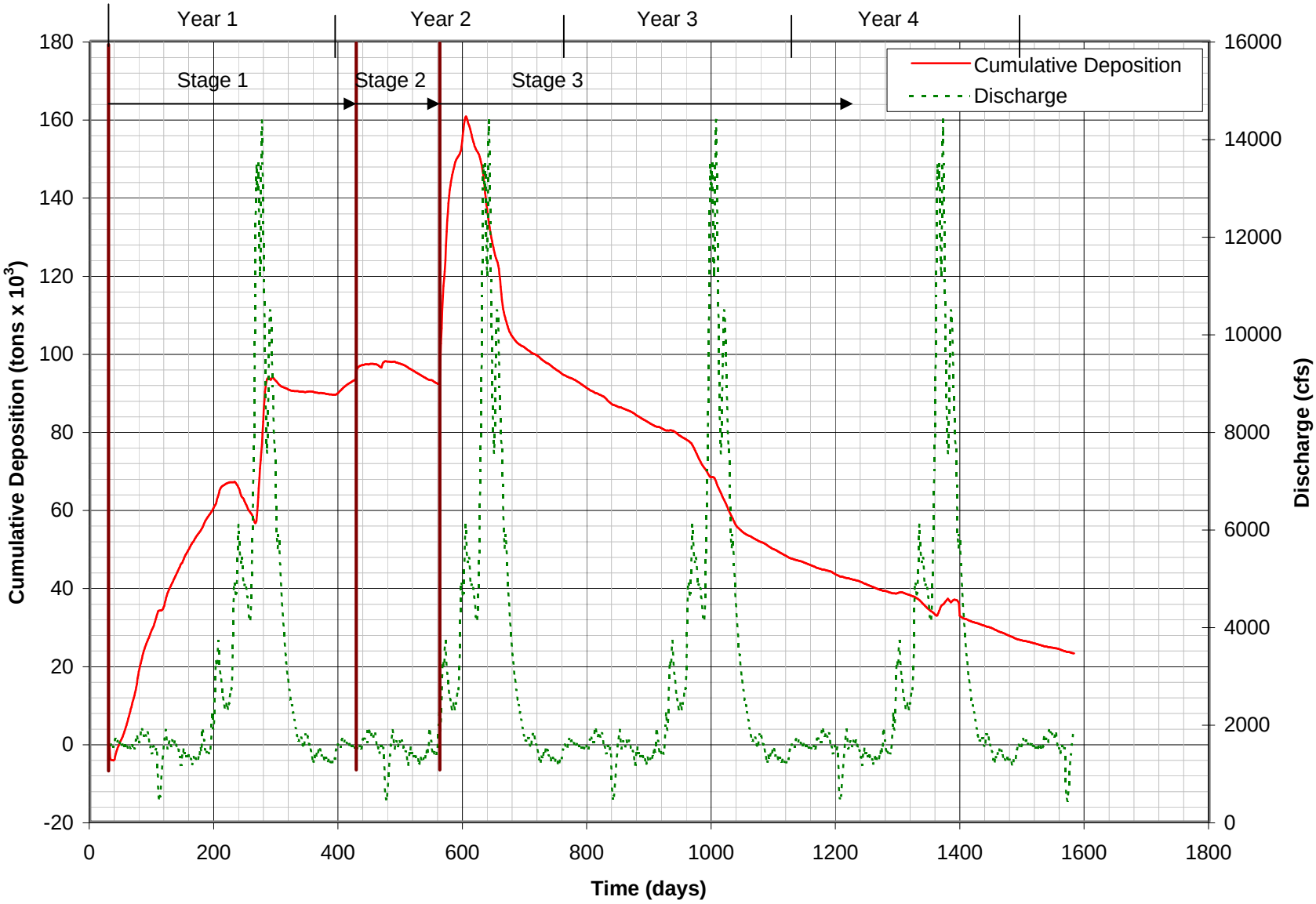

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Figure 4-16
Milltown Dam - Shields Mobility Threshold

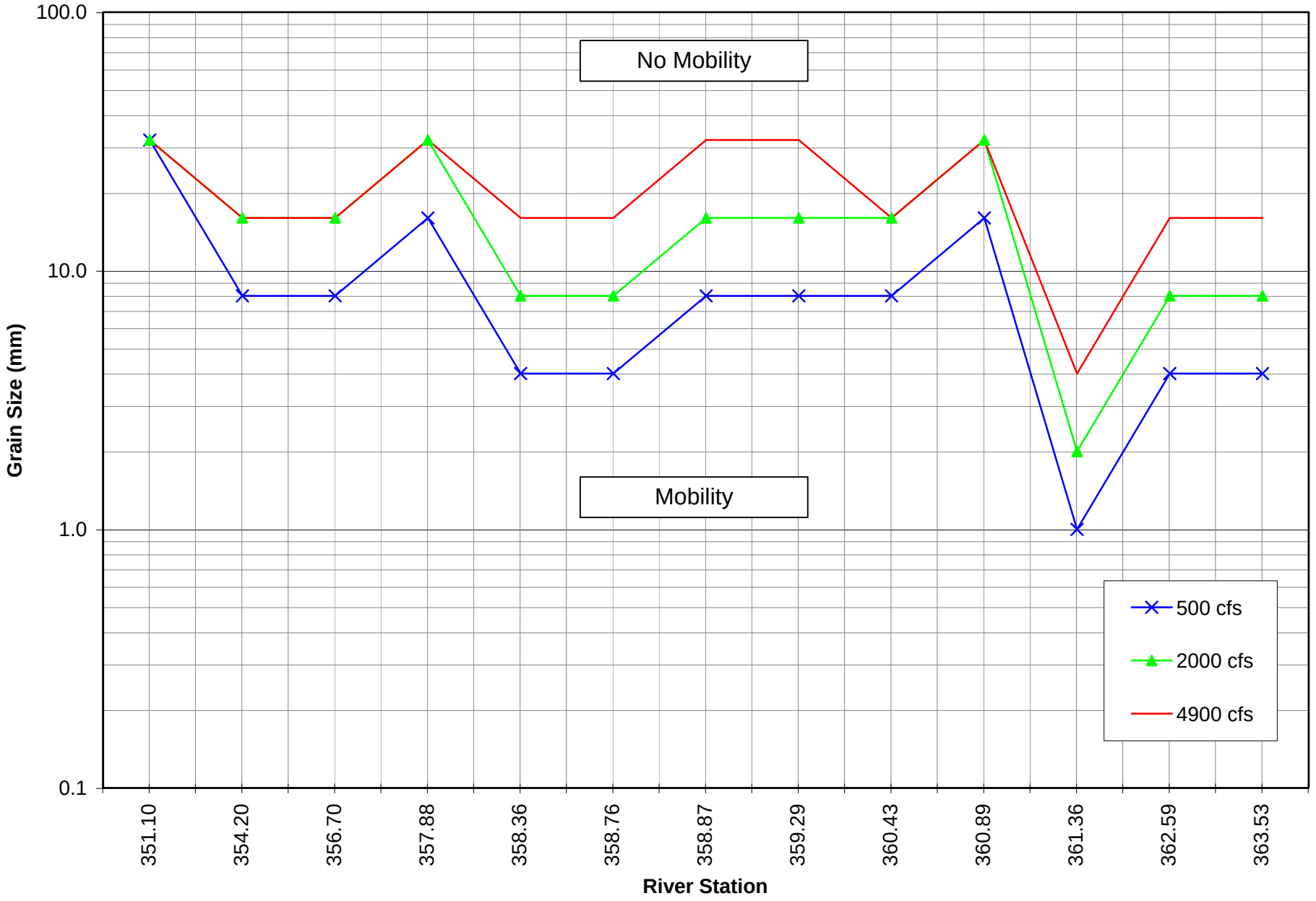

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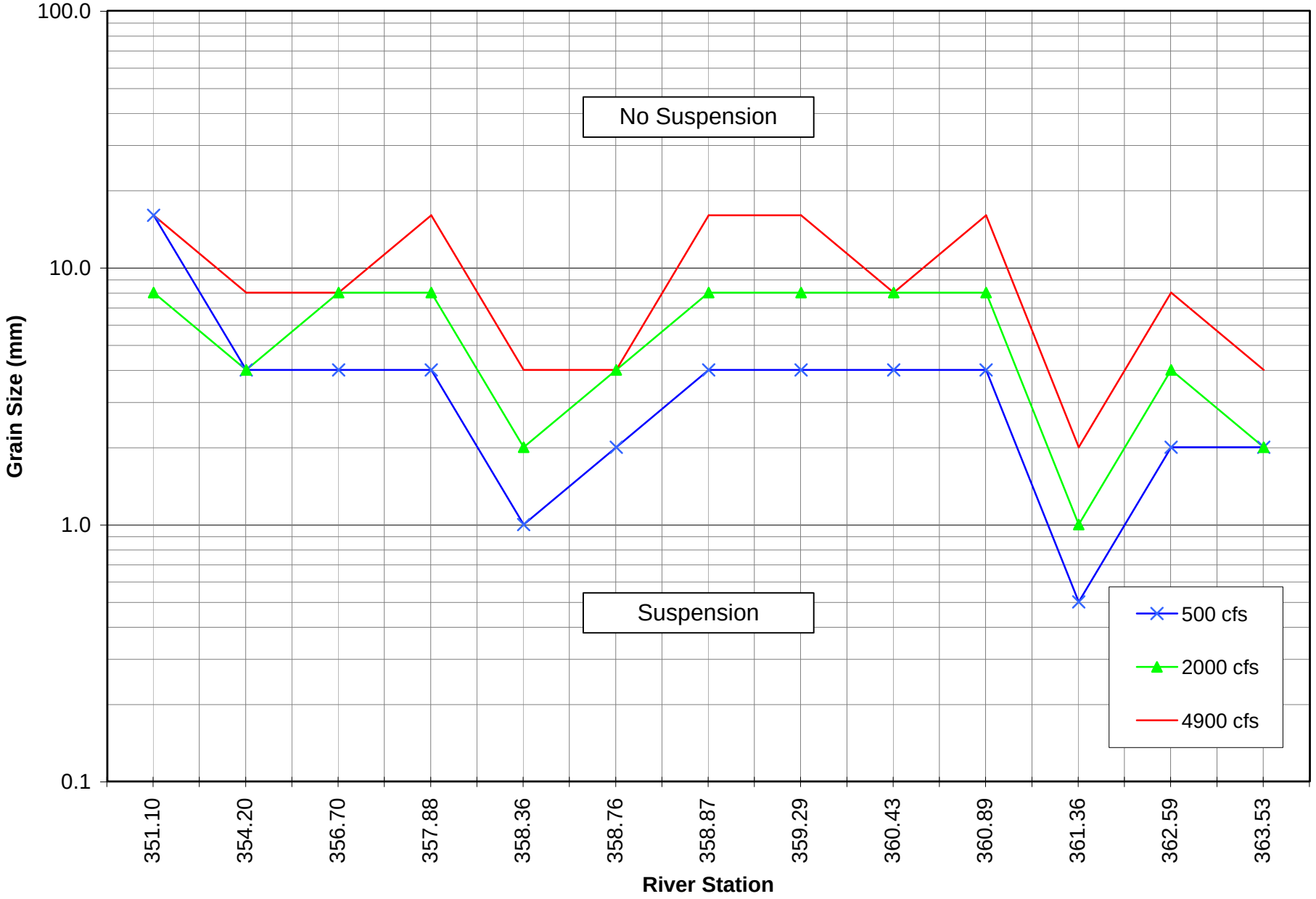
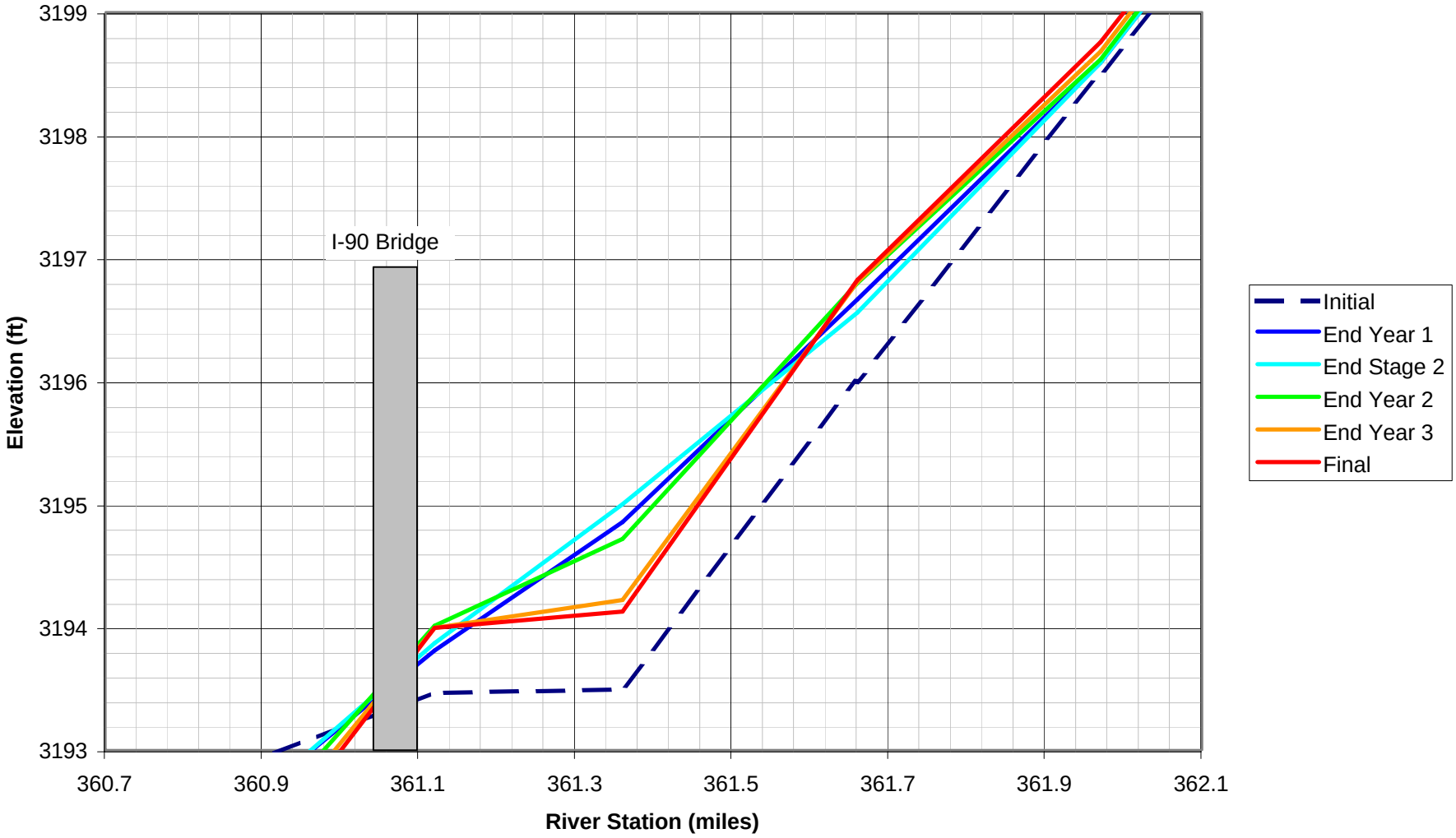
Figure 4-17
Milltown Dam - Van Rijn Suspension Threshold



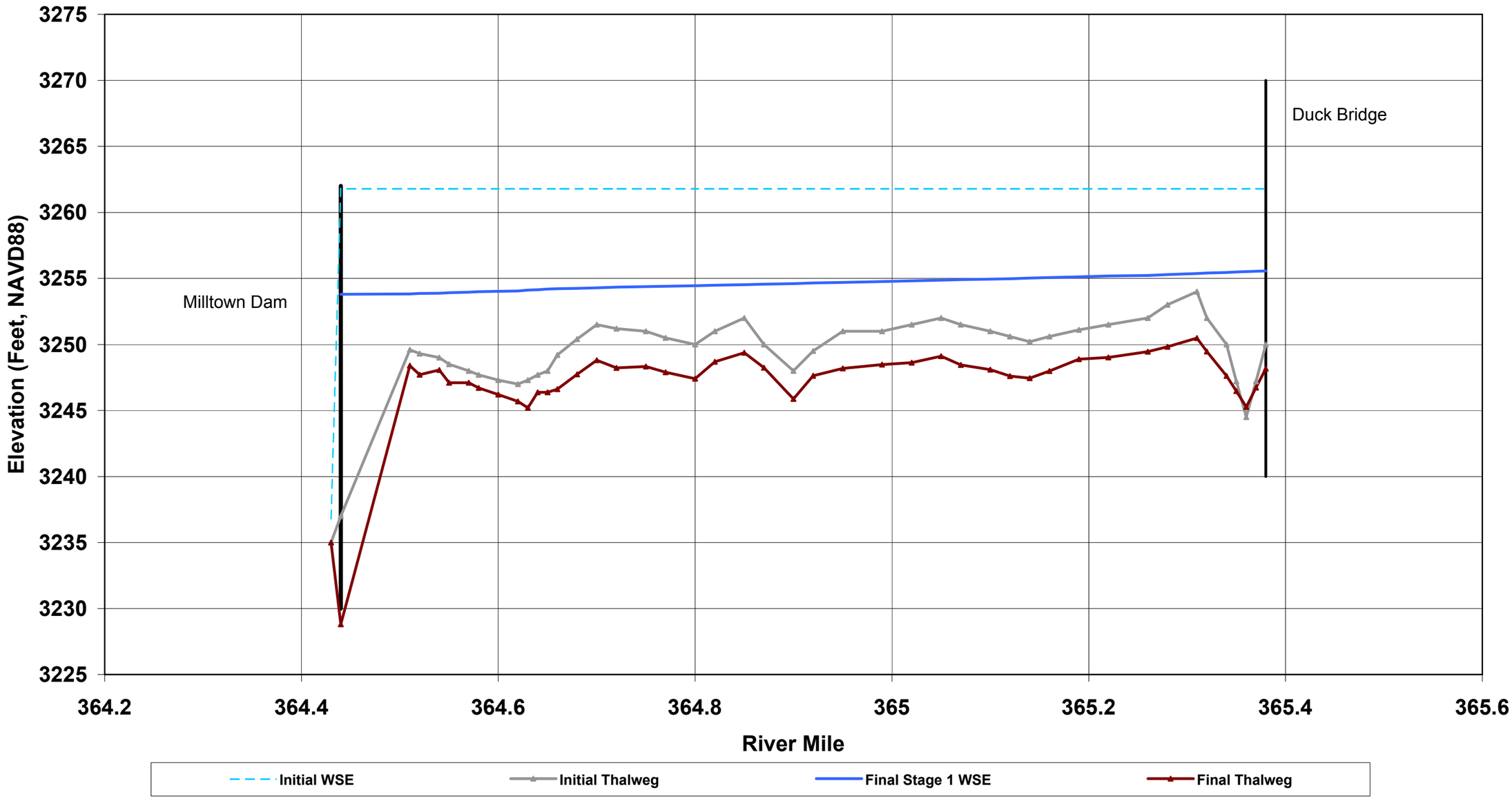
milltown RD-RA/Scour Evaluation/Nov 20 Submittal/Figs 4-16,17 Mobility.xls/Figure 4-17

Figure 4-18
Bed Profile at I-90 Bridge near East Missoula



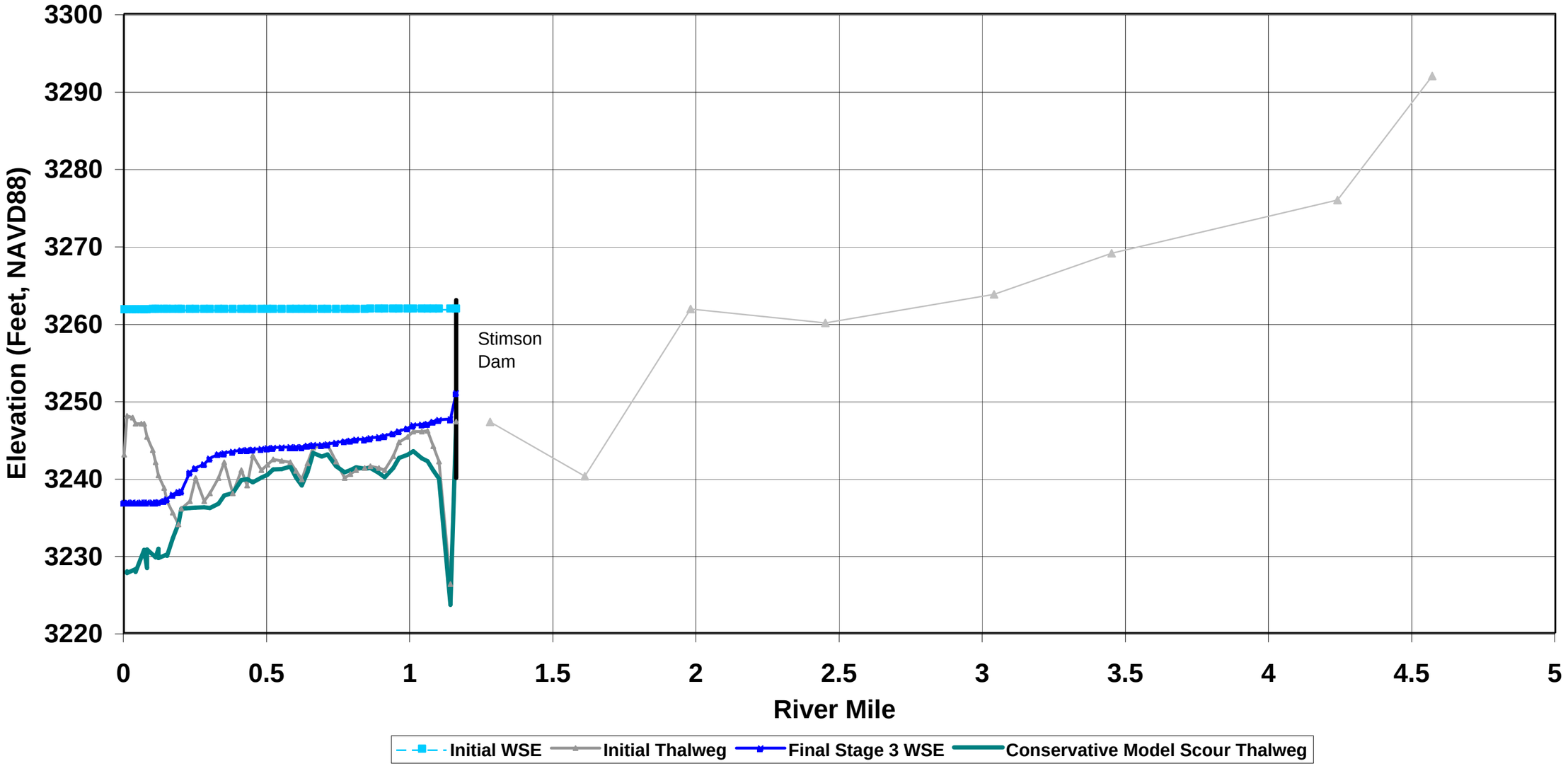
H:\Projects\Milltown RD-RA\Scour Evaluation\May 17, 2004 Submittal\Figures\Section 4 Figs\Fig 4-18 BridgeProfile.xlsFig 4-18 Downstream Profile

Figure 4-19 - Longitudinal Profile of CFR Between Milltown Dam and Duck Bridge



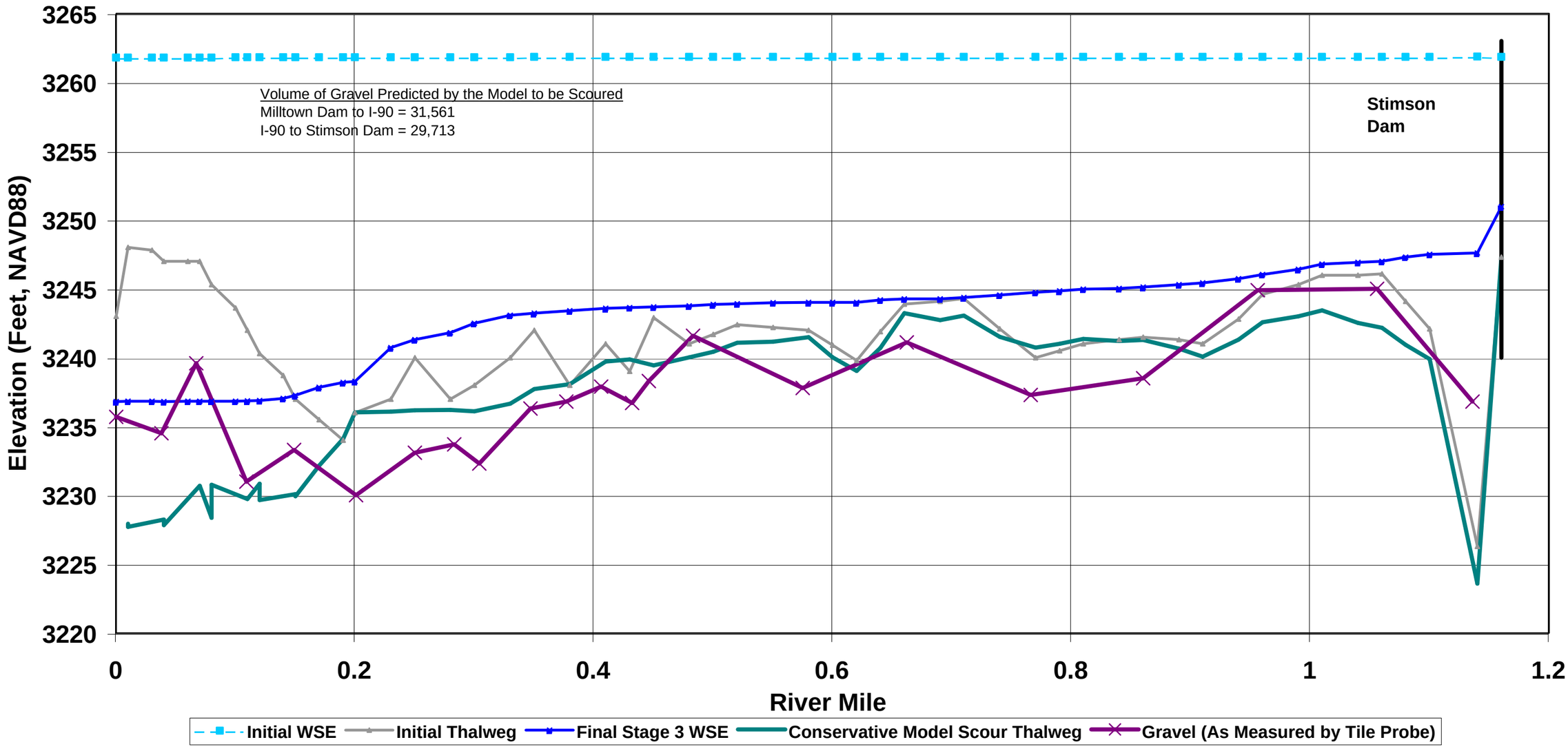
Note: WSE = Water surface elevation at average annual flow.

Figure 4-20a - Longitudinal Profile of BFR



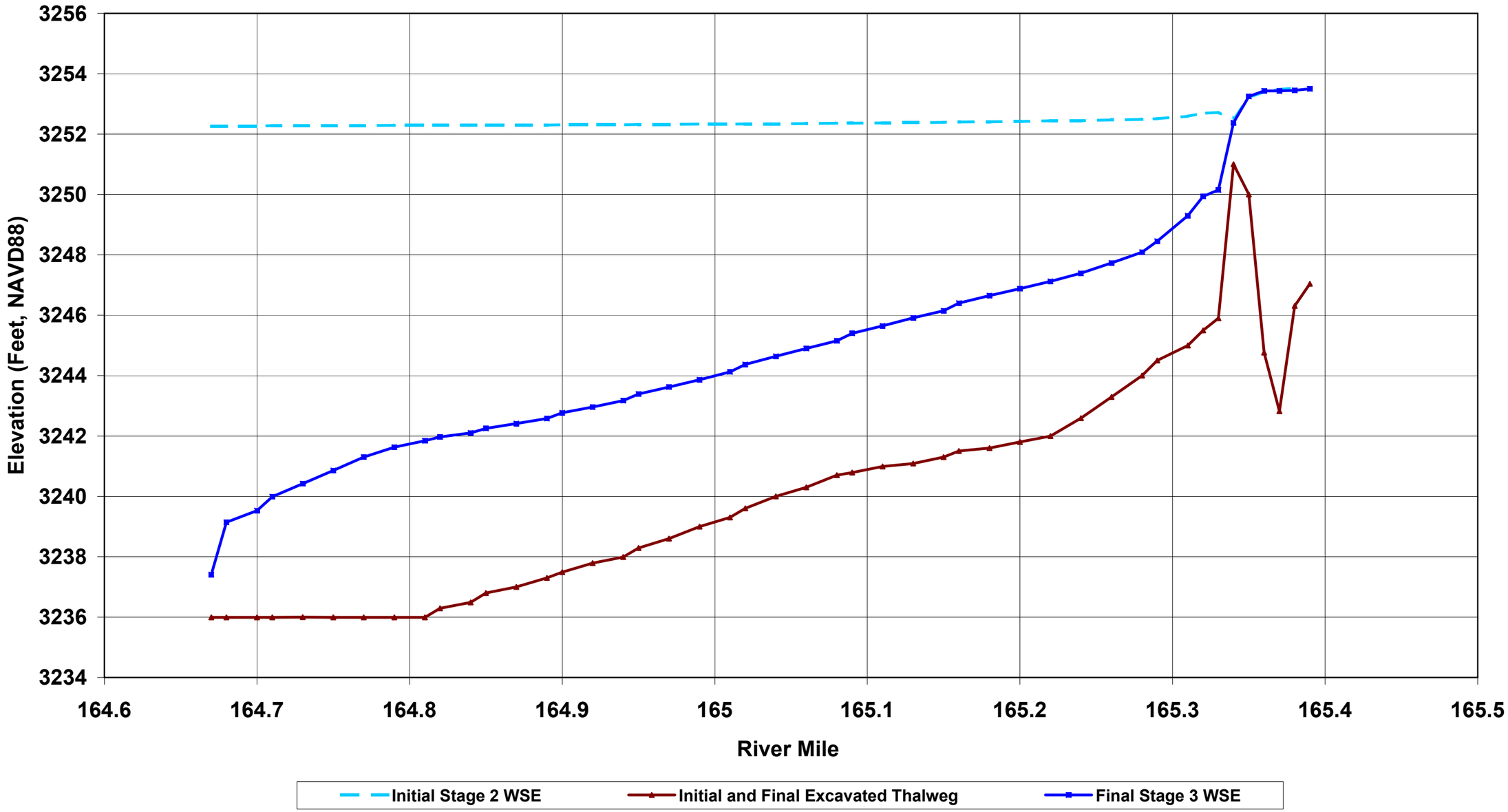
Note: WSE = Water surface elevation at average annual flow. Conservative model scour thalweg elevation based on predicted scour under the general model bed gradations tailored to the sediment layer.

Figure 4-20b - Longitudinal Profile of BFR from Milltown Dam to Stimson Dam with Gravel Layer Elevation Identified



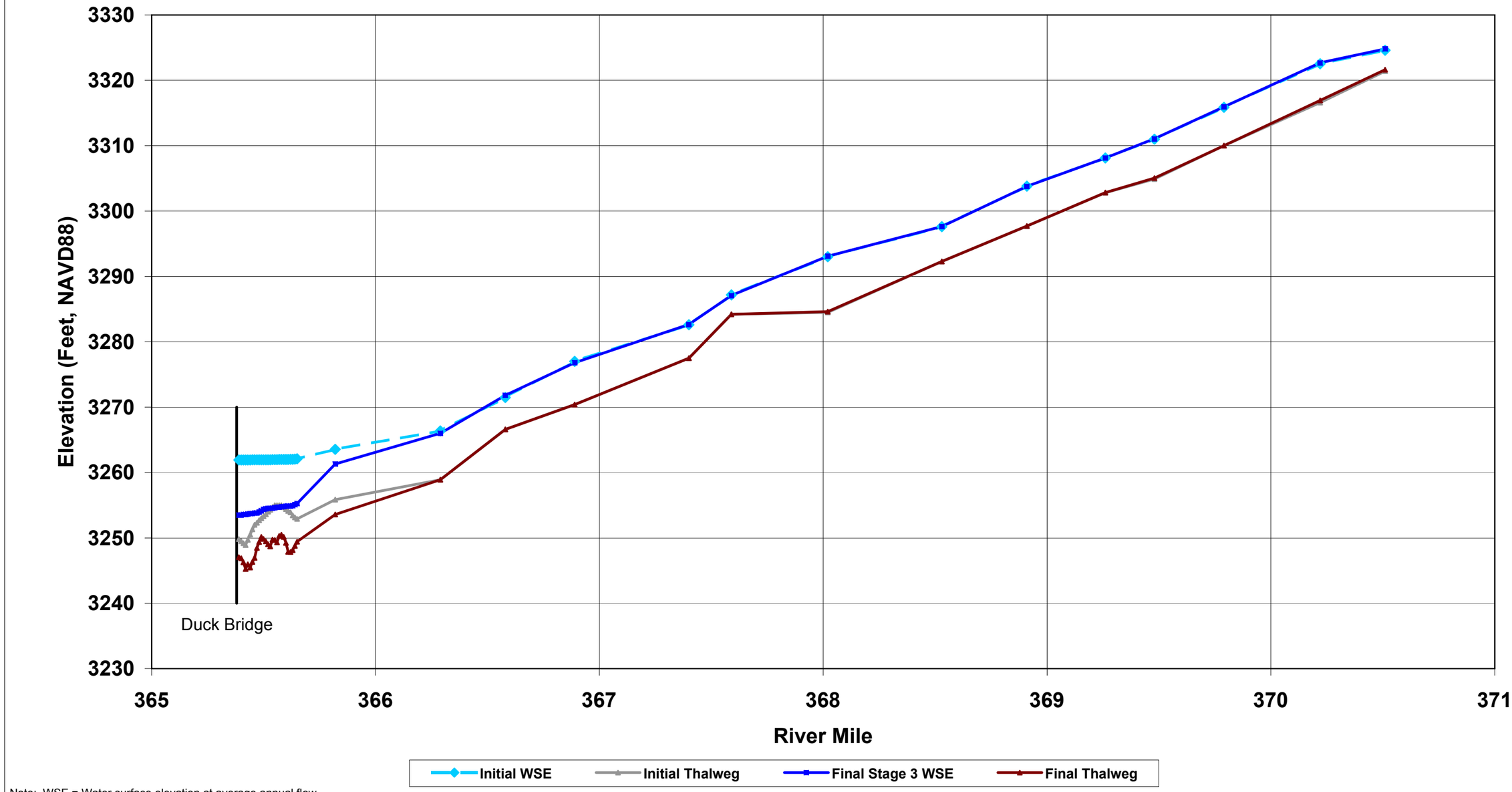
Note: WSE = Water surface elevation at average annual flow. Conservative Model Scour Thalweg based on the general model gradations tailored to the sediment layer.
Tile probe measurement of gravel elevation +_ 1 foot.

Figure 4-21 - Longitudinal Profile of Bypass Channel



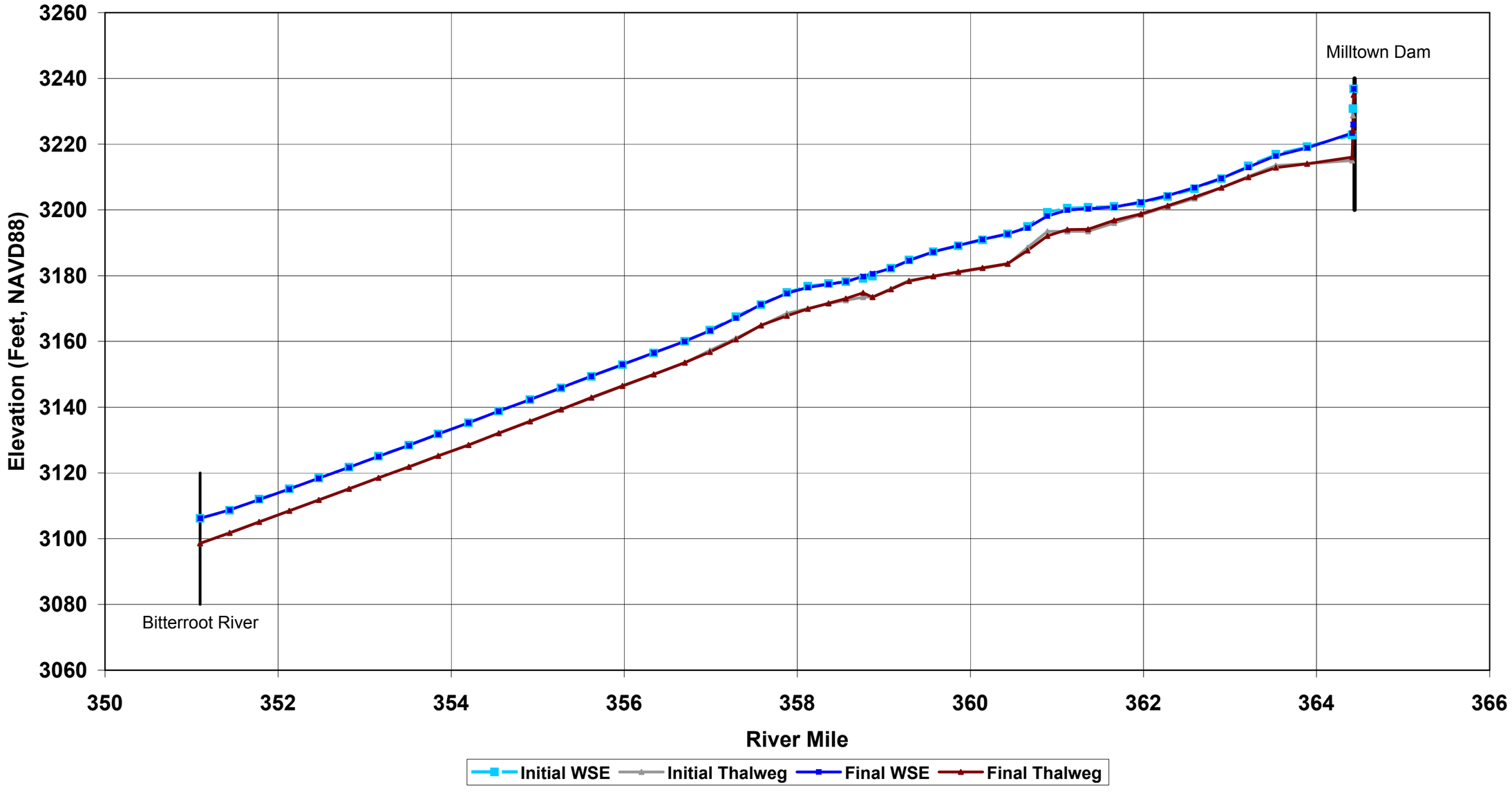
Note: WSE = Water surface elevation at average annual flow.

Figure 4-22 - Longitudinal Profile of CFR Upstream of Duck Bridge



Note: WSE = Water surface elevation at average annual flow.

Figure 4-23 - Longitudinal Profile of CFR Downstream of Milltown Dam



Note: WSE = Water surface elevation at average annual flow.

Figure 4-24 - BFR Cross Section 0.03 at End of Stage 3 Looking Downstream

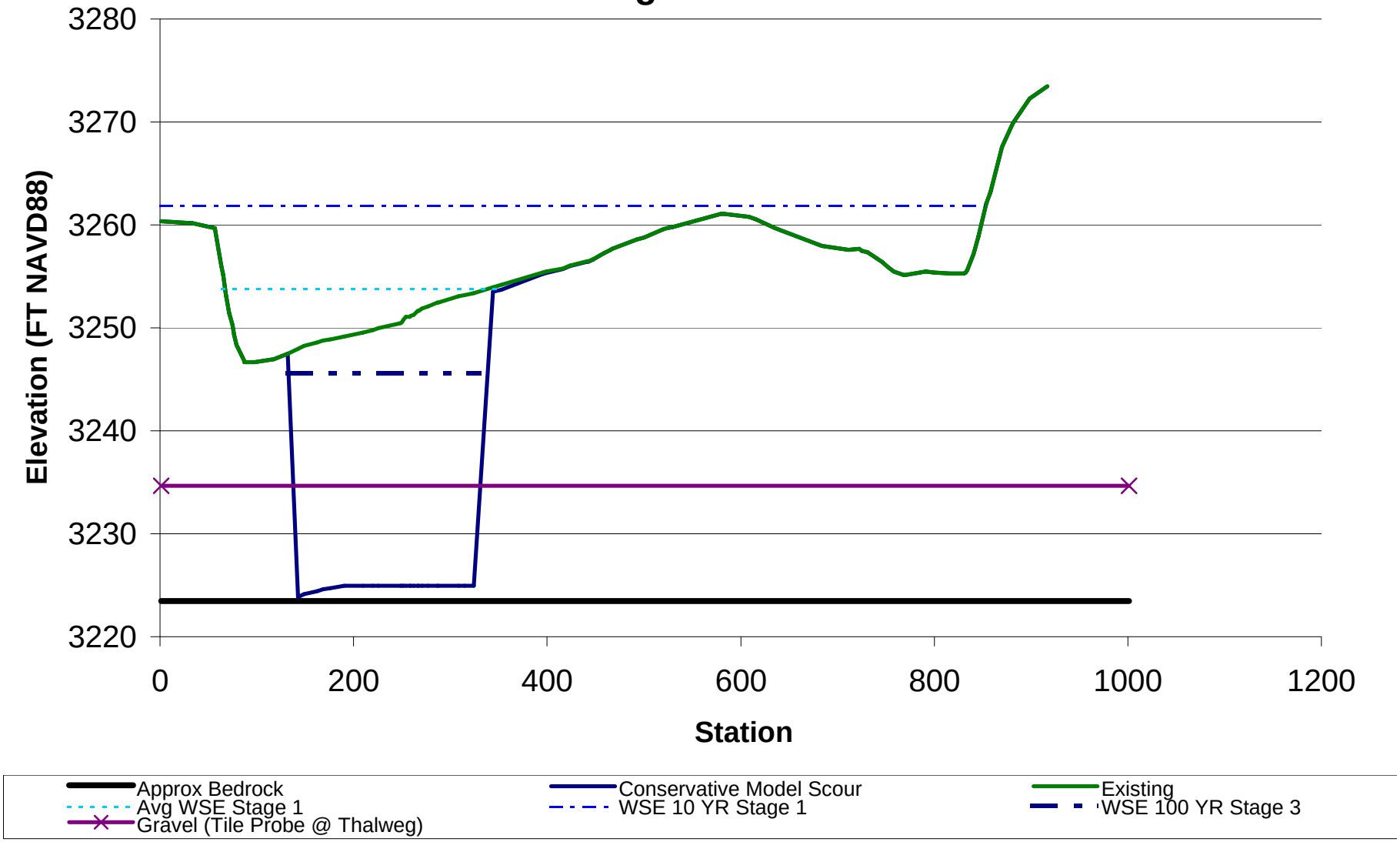


Figure 5-1
Suspended Sediment Load for USGS Gages

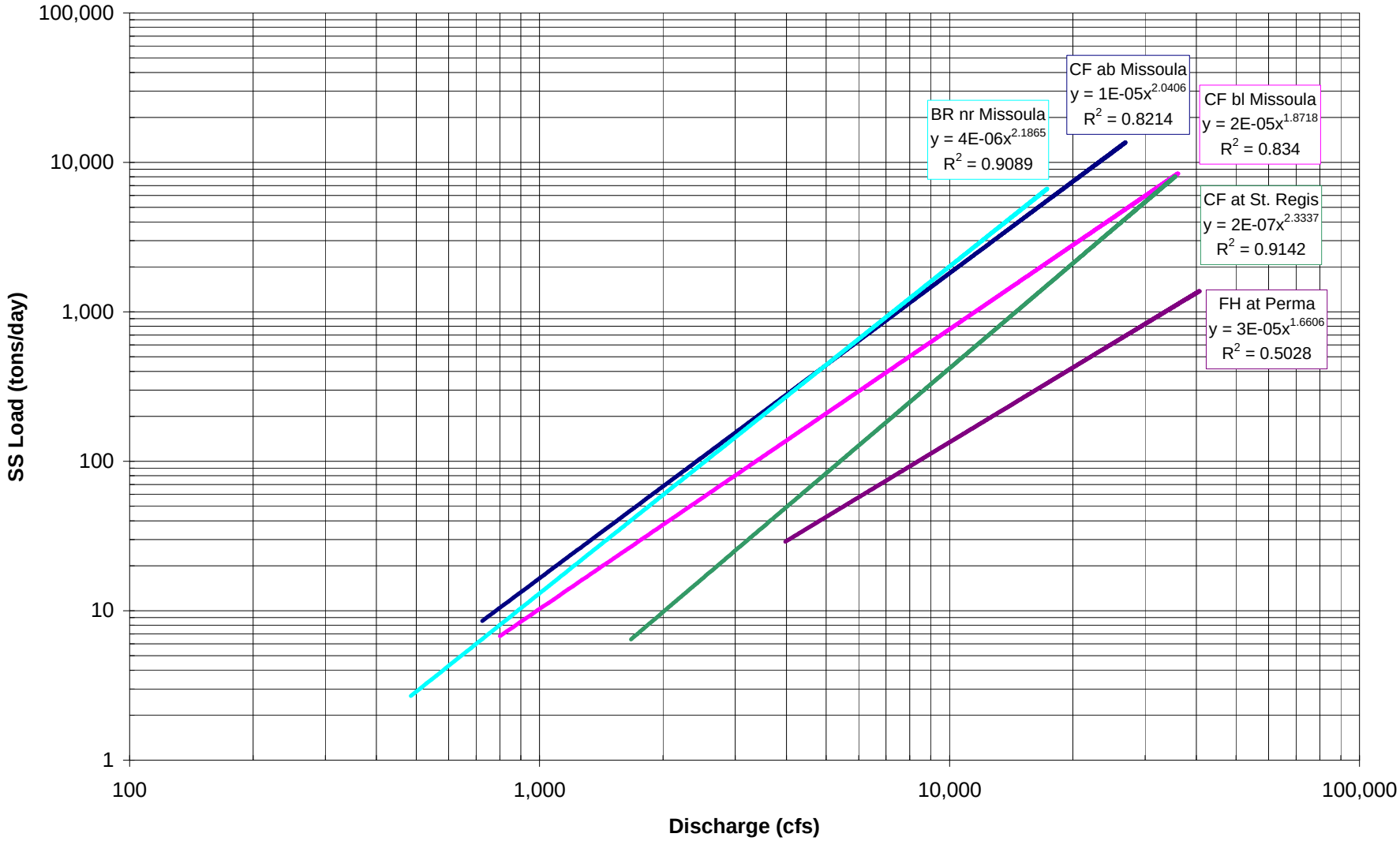
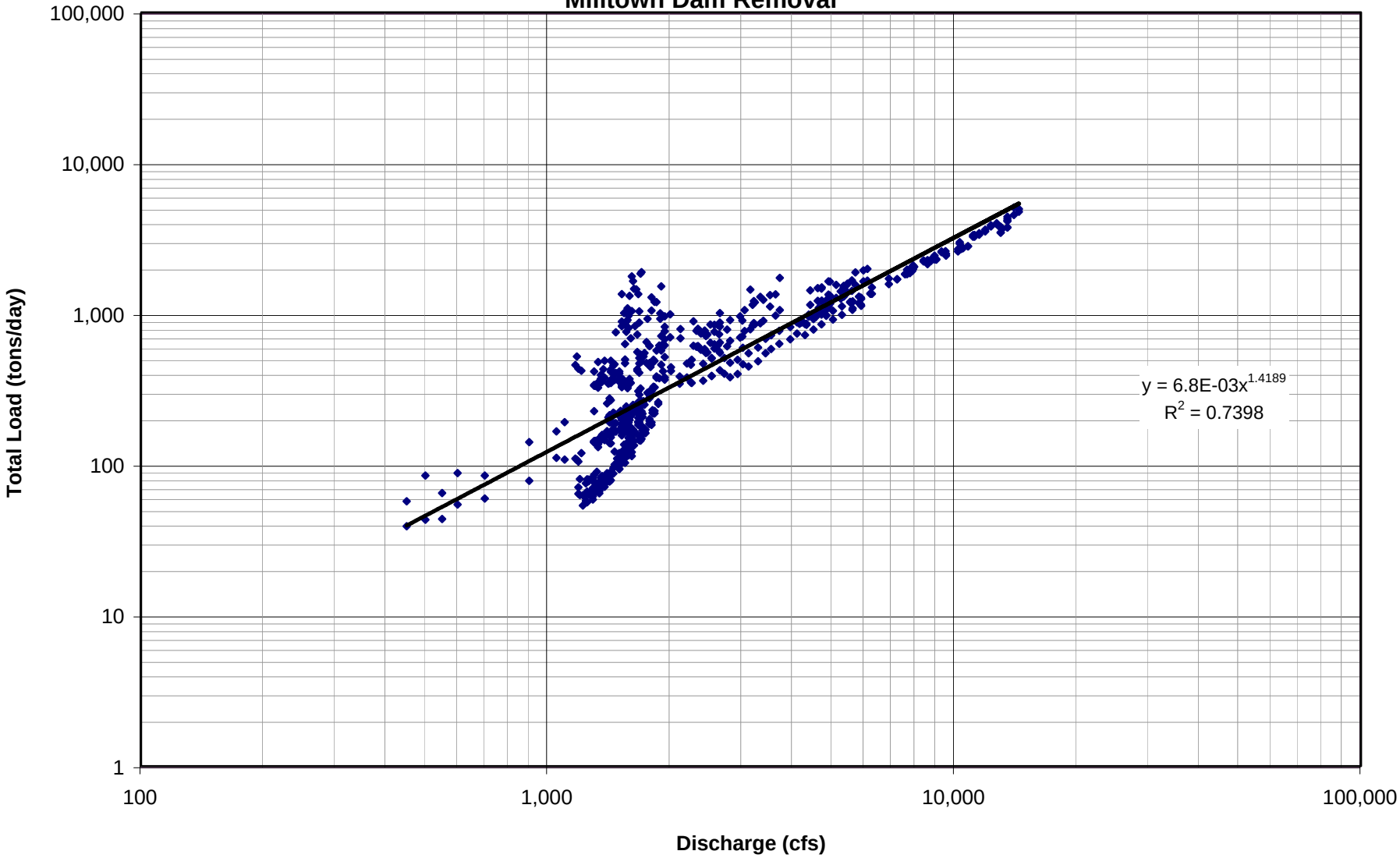


Figure 5-2
Total Sediment vs. Discharge at Downstream Boundary
Milltown Dam Removal



H:\Projects\Milltown RD-RA\Scour Evaluation\May 17, 2004 Submittal\Figures\Section 5 Figs\Fig 5-1-2 WEST.xlsFigure 5-2

Figure 5-3
Predicted Downstream Total Metals Concentrations for Full Bypass Scenario

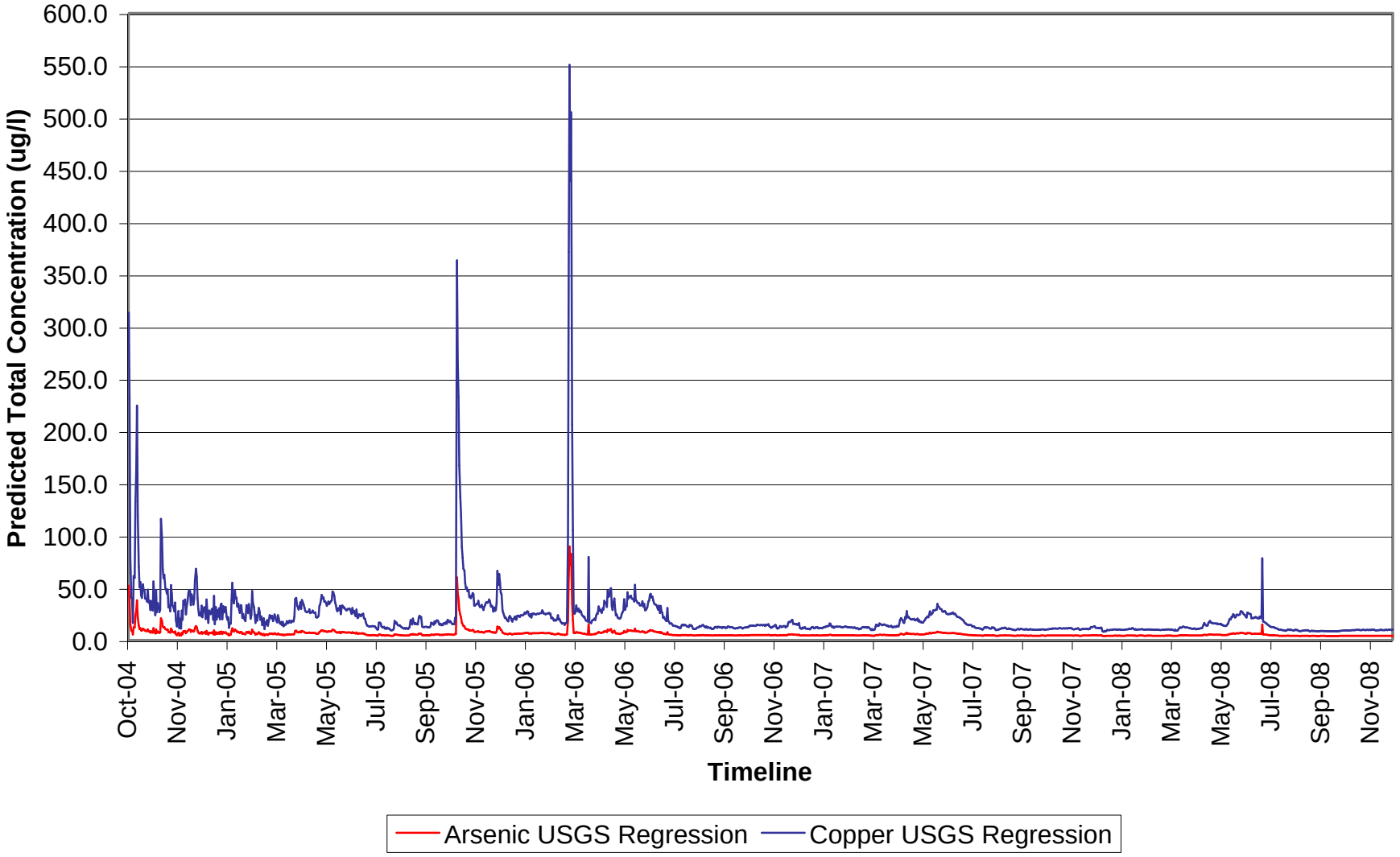


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Figure 5-4
Predicted Downstream Dissolved Arsenic versus TSS Concentrations for Full Bypass Scenario

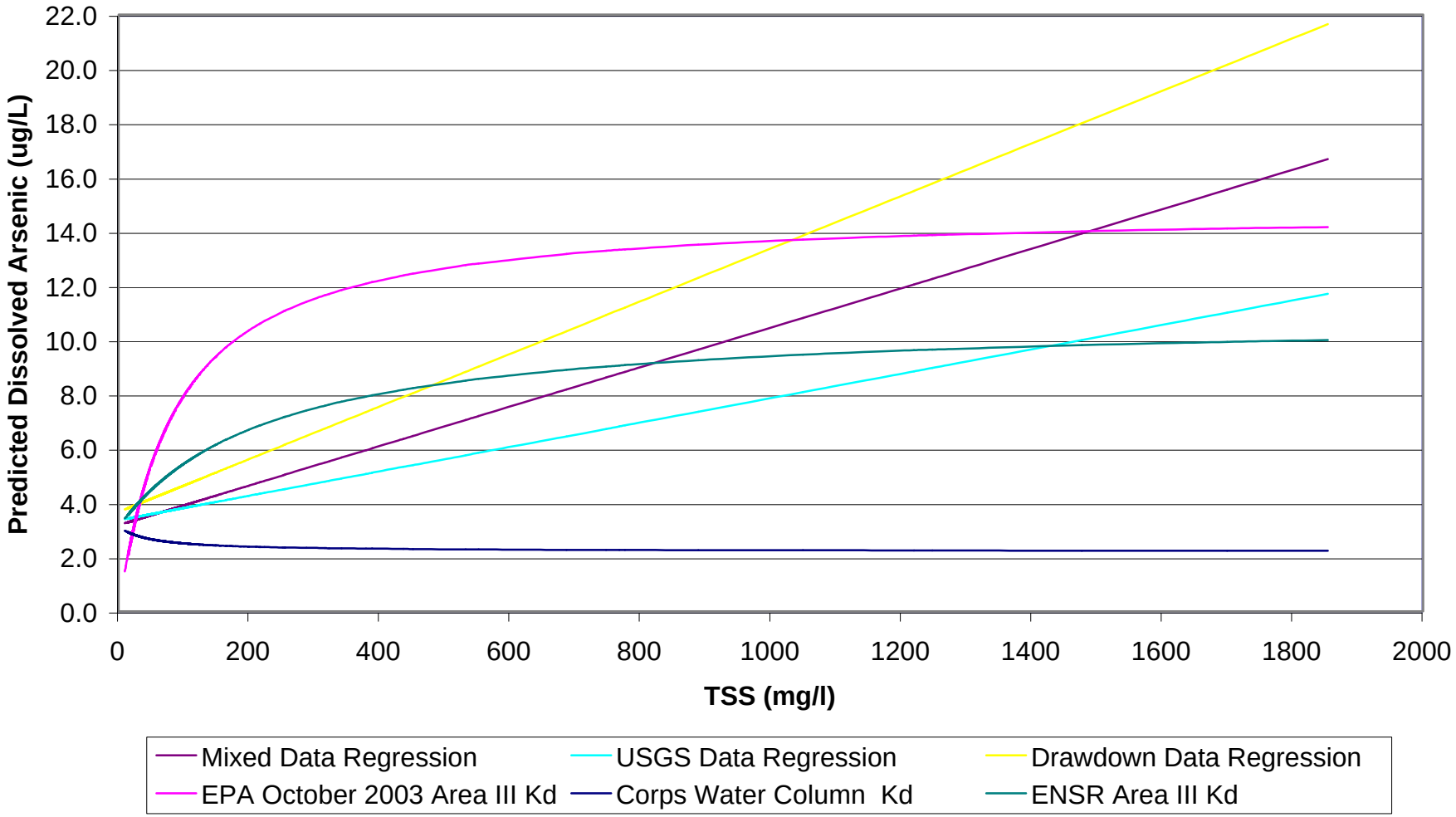

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Figure 5-5
Predicted Downstream Dissolved Copper versus TSS Concentrations for Full Bypass Scenario

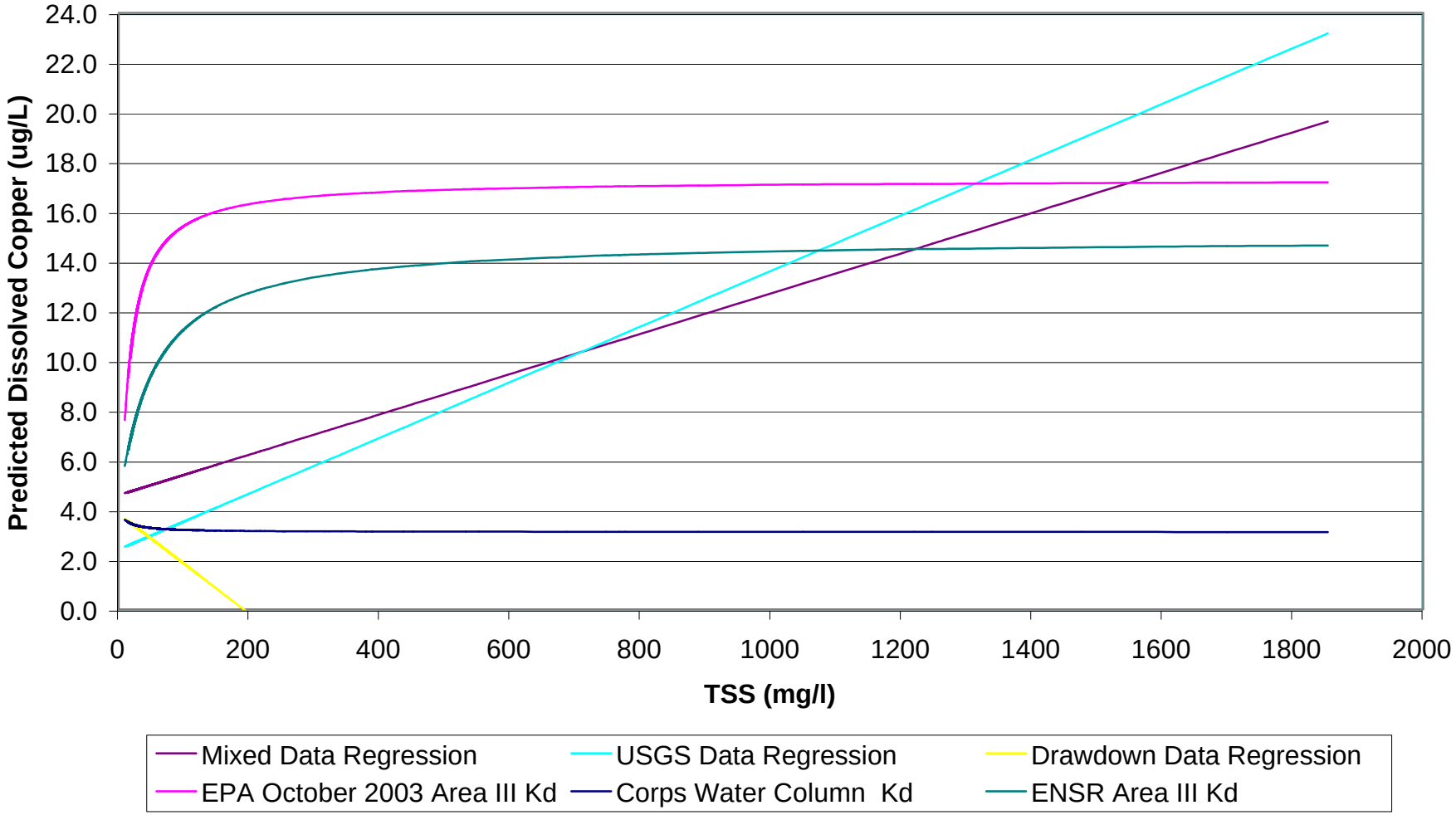

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Figure 5-6
Predicted Downstream Dissolved Metals Concentrations versus Time for Full Bypass Scenario

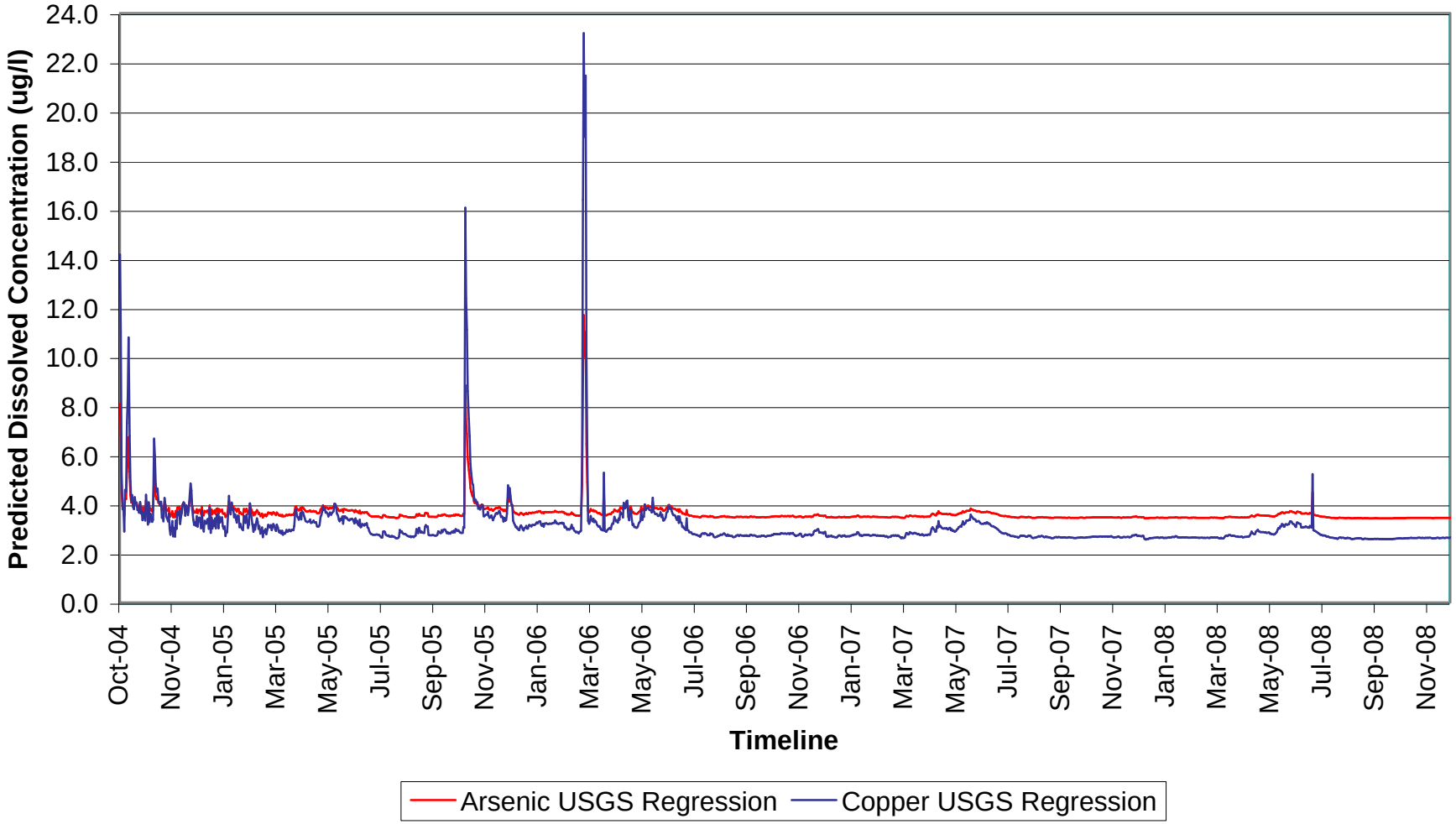

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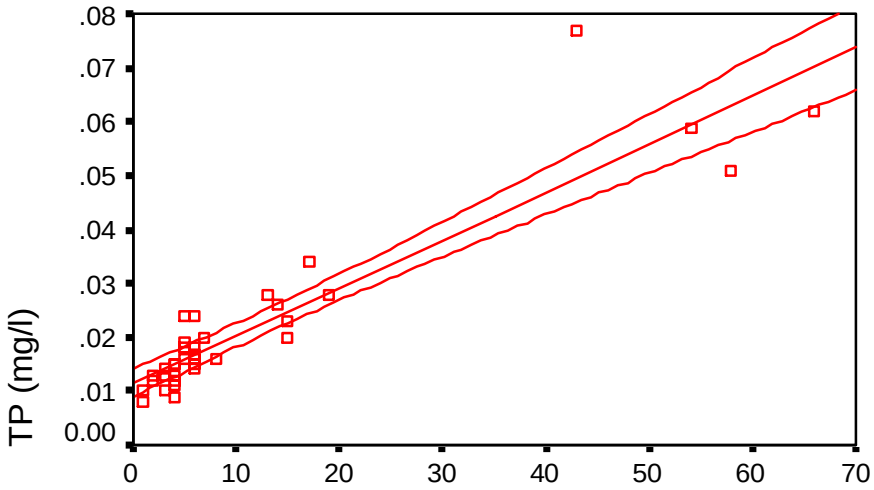
Figure 5-7

Total P vs Total Suspended Solids

Clark Fork above Missoula Station



TSS (mg/l)

Tri-State Water Quality Council

1990-1992, 1998

Figure 5-8

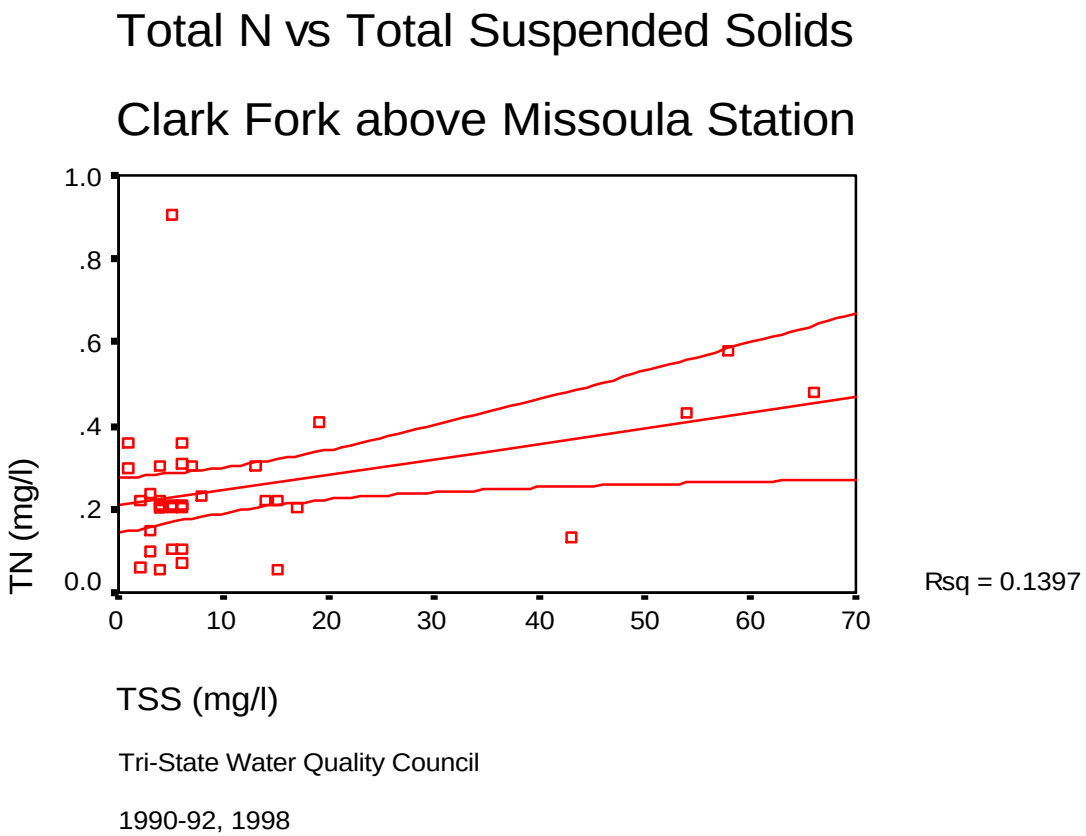
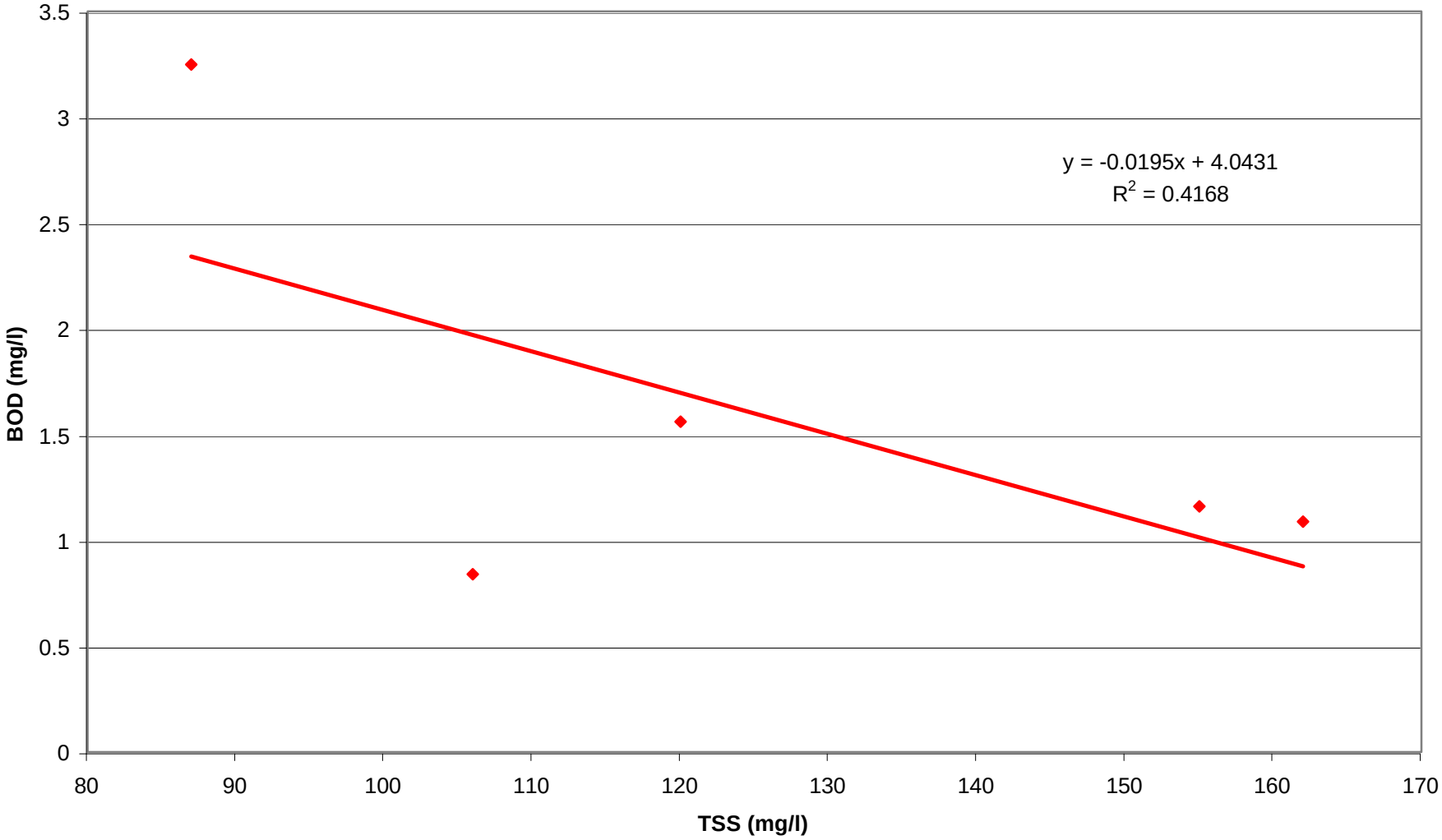

Total N vs Total Suspended Solids
Clark Fork above Missoula Station
TN (mg/l)
1.0
.8
.6
.4
.2
0.0
0
10
20
30
40
50
60
70
Rsq = 0.1397
TSS (mg/l)
Tri-State Water Quality Council
1990-92, 1998

Figure 5-9
Total Suspended Solids vs. Biological Oxygen Demand August 2002 Milltown Reservoir Drawdown



LEGEND:

POINTS OF DIVERSION

- Pump
- Headgate or Other Diversion

LAND COVER

- Open Water
- Perennial Ice/Snow
- Low Intensity Residential
- High Intensity Residential
- Commercial/Industrial/Transportation
- Bare Rock/Sand/Clay
- Transitional
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Shrubland
- Grasslands/Herbaceous
- Pasture/Hay
- Row Crops
- Small Grains
- Fallow
- Urban/Recreational Grasses
- Woody Wetlands
- Emergent Herbaceous Wetlands

N

1:63,360
1 inch equals 5,280 feet

FEET
5,000 0 5,000

CONTOUR INTERVAL = 100 FEET

REFERENCES:

FILENAME - CLARKFORK_WR-PODs_11x17.MXD
BACKGROUND LAYER - NATIONAL LAND COVER DATASET*

*The National Land Cover Dataset was compiled from Landsat satellite TM imagery (circa 1992) with a spatial resolution of 30 meters and supplemented by various ancillary data.

ENVIROCON
101 INTERNATIONAL WAY
MISSOULA, MONTANA 59808

PUMP & DITCH DIVERSION LOCATIONS
CLARK FORK RIVER - MILLTOWN DAM TO BITTERROOT RIVER

PREPARED BY
LAND & WATER CONSULTING, INC.
1120 CEDAR STREET MISSOULA, MT 59807 (406)721-0354

FIGURE 5-10

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Checked:	ISSUED FOR...
Approved:	
Date: 10/13/03	
Dwg. No.:	

LEGEND:

POINTS OF DIVERSION

- Pump
- Headgate or Other Diversion

LAND COVER

- Open Water
- Perennial Ice/Snow
- Low Intensity Residential
- High Intensity Residential
- Commercial/Industrial/Transportation
- Bare Rock/Sand/Clay
- Transitional
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Shrubland
- Grasslands/Herbaceous
- Pasture/Hay
- Row Crops
- Small Grains
- Fallow
- Urban/Recreational Grasses
- Woody Wetlands
- Emergent Herbaceous Wetlands

N

1:63,360
1 inch equals 5,280 feet

FEET
5,000 0 5,000

CONTOUR INTERVAL = 100 FEET

REFERENCES:

FILENAME - CFR-DAM2BR_WRv2.MXD
BACKGROUND LAYER - NATIONAL LAND COVER DATASET*

*The National Land Cover Dataset was compiled from Landsat satellite TM imagery (circa 1992) with a spatial resolution of 30 meters and supplemented by various ancillary data.

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MISSOULA, MONTANA 59808

DITCH DIVERSION LOCATIONS
CLARK FORK RIVER - MILLTOWN DAM TO BITTERROOT RIVER

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1120 CEDAR STREET MISSOULA, MT 59807 (406)721-0354

FIGURE 5-11

Revision: 1

ISSUED FOR...

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Checked:
Approved:
Date: 10/13/03
Dwg. No.:

Photo 1. Missoula Irrigation District Diversion

Photo 2. Orchard Homes Ditch Company

Photo 3. Hellgate Irrigation District Diversion (Flynn-Lowney Ditch)

Photo 4. Grass Valley - French Diversion

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CLARK FORK RIVER
IRRIGATION DIVERSIONS

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FIGURE 5-12

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Dwg. No.:	Revision: 1